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Production Prospects For

WHEAT, FEED, AND LIVESTOCK

1960-65

Agricultural Research Service - Washington, D.C. - December 1959 - ARS 43-115
UNITED STATES DEPARTMENT OF AGRICULTURE

PREFACE

This report is intended to present an analysis of the production prospects for wheat, feed grains, and livestock for the 1960-65 period, and to relate prospective output to potential outlets. The projections of crop yields were made in cooperation with scientists in the Crops, Soil and Water Conservation, Entomology, and Agricultural Engineering Research Divisions of ARS.

The report was prepared under the general direction of a committee in the Farm Economics Research Division, ARS, composed of C. P. Heisig, Director; K. L. Bachman, Assistant Director; H. L. Stewart, Chief, Agricultural Adjustments Research Branch; O. J. Scoville, Chief, Costs, Income, and Efficiency Research Branch; R. P. Christensen, and R. V. Baumann; and S. E. Johnson, Office of the Administrator, ARS. Valuable assistance was provided by several staff members of the Farm Economics Research Division - G. T. Barton and R. O. Rogers, in the development of the yield projections; H. H. Wooten, in the land use projections; and E. F. Hodges in the estimates of feed requirements.

Data on crop and livestock production and utilization, as well as other materials prepared by the Agricultural Marketing Service, were used in the preparation of the report.

Prepared in

Farm Economics Research Division

Agricultural Research Service

United States Department of Agriculture

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PRODUCTION PROSPECTS FOR WHEAT, FEED, AND LIVESTOCK, 1960-65

By Raymond P. Christensen, Sherman E. Johnson, and Ross V. Baumann 1/

SUMMARY AND CONCLUSIONS

In recent years, agricultural production has continued to exceed use outlets for farm products, despite production restrictions and special disposal programs.

The rate of increase in farm output was greatly accelerated during the World War II years, and the pace has continued in the 1950's. Higher production per acre and per animal resulting from adoption of improved technology and management is the chief source of output expansion.

Excess production capacity is especially acute in wheat and feed grains, which, together with forage and pasture for livestock, occupy the bulk of our farmland. In view of the relative importance of these land uses, this report considers production prospects for wheat, feed grains, and livestock in the years 1960-65 and relates prospective output to potential outlets.

Recent trends were examined and potential production and uses were projected. The projections were made chiefly on the basis of continuation of present prices and costs, present production and disposal programs, and 1959 levels of per capita domestic consumption and recent export levels. The forces back of recent increases in output still have unexpended power; therefore, further increases in crop yields are projected on the assumption of average weather.

1/ Agricultural Economist, Farm Economics Research Division, ARS, Chief Economist, Agricultural Research Service; and Agricultural Economist, Farm Economics Research Division, ARS, respectively.

The appraisal of wheat, feed, and livestock prospects for 1960-65 comes out about as follows:

(1) With continuation of present prices, costs, and farm programs (including 28 million acres in the Conservation Reserve Program), we should expect excess production of wheat and feed grains unless serious drought intervenes.

(2) Increased demand arising from population growth is likely to be more than offset by the expanded output resulting from continued increases in crop and livestock production. The problem of excess capacity, therefore, is likely to persist unless new markets are developed or growing conditions are unfavorable.

(3) If the projected output of wheat, feed grains, forage, and pasture materializes, increasingly large supplies of feed from each year's production will be available for substantial increases in output of livestock products. Or alternatively, the 1959 levels of exports and domestic per capita consumption of livestock products can be maintained on 15 to 18 million fewer wheat and feed-grain acres than were harvested in 1959.

(4) If consumption of red meat increases by 7 pounds per person from the 1959 level, in accordance with projection of the 1940-59 trend-line, the estimate of 15 to 18 million harvested acres of excess feed grains and wheat would be reduced by 5 to 6 million acres. But this reduction would be largely offset if the yield of corn per acre should follow the 1940-59 trend rather than the slower rate projected in this analysis or if considerable progress is made in efficiency of livestock feeding.

(5) If annual wheat exports were reduced from 450 million projected in this report to 250 million bushels, the excess capacity would be increased by the equivalent of 10 million acres. Under these conditions, the excess of wheat and feed-grain capacity might be equivalent to 25 million harvested acres excluding the acreage in the Conservation Reserve.

(6) If the wheat and feed grains produced on the 15 to 18 million excess acres under average growing conditions were fed to additional meat animals, the number of pounds of red meat available for consumption per person would rise from 158 pounds in 1959 to about 173 pounds in 1960, and 181 pounds in 1965. An increase in red meat supplies of 10 to 15 percent per person would mean price trouble for livestock producers. Other methods of dealing with excess wheat and feed-grain capacity will need to be explored.

THE PRESENT PRODUCTION SITUATION

In recent years, agricultural production has continued to outrun demand for farm products. Stocks of wheat, feed grains, and other products have accumulated in warehouses, despite such restrictions as acreage allotments, marketing quotas and Soil Bank Programs, and despite special disposal programs in both domestic and foreign markets.

The present overabundance of farm products is not attributable to low consumer purchasing power, as in the depression years of the 1930's. Consumer incomes are high, and consumption per person remains well above prewar years. Neither can the overabundance be ascribed to lack of exports - large foreign shipments have been maintained by adding special disposal programs to sales for dollar exchange.

The chief reason for the overabundance of production in relation to available markets becomes evident if we study figure 1, which shows the annual physical volume of farm output from 1910 to date. Two trendlines have been calculated: One is based on average annual production from 1910 to 1931 (up to the severe drought of the 1930's) and extended to 1960. The other is based on average annual production from 1937 through 1957 and also extended to 1960. The trend computed for recent years does not include the outputs of 1958 or 1959 when crop yields were exceptionally high. If the output for 1958 and the preliminary estimate for 1959 had been included, the line would have an even steeper upward slope. In 1958, farm output was 24 percent above the average for the years 1947-49. Tentative estimates made on the basis of the October 1, 1959, Crop Production report indicate that total farm output in 1959 will be 25 percent above that of 1947-49.

If farm output had increased at the slower rate of the years 1910-31, and if markets had expanded at the rates actually experienced, there would be no present concern about farm surpluses. But the rate of increase in output was greatly accelerated in the World War II years, with the acceleration continuing and with no statistical evidence of abatement of the forces causing it. Unless restrained by unfavorable weather or by effective programs designed to retard the increase, these forces seem still to have unexpended power. With 1947-49 as 100 percent, crop production per acre averaged 116 in the years 1956-58, and 126 in 1958. The tentative estimate for 1959 is 123. Livestock production per breeding unit averaged 120 in the years 1956-58, and 125 in 1958. The tentative indication for 1959 is 123 percent of 1947-49.

Adoption of combinations of improved technology and management that have so greatly increased the output per acre and per animal has resulted in rapid expansion of total farm output. Although farm prices have declined

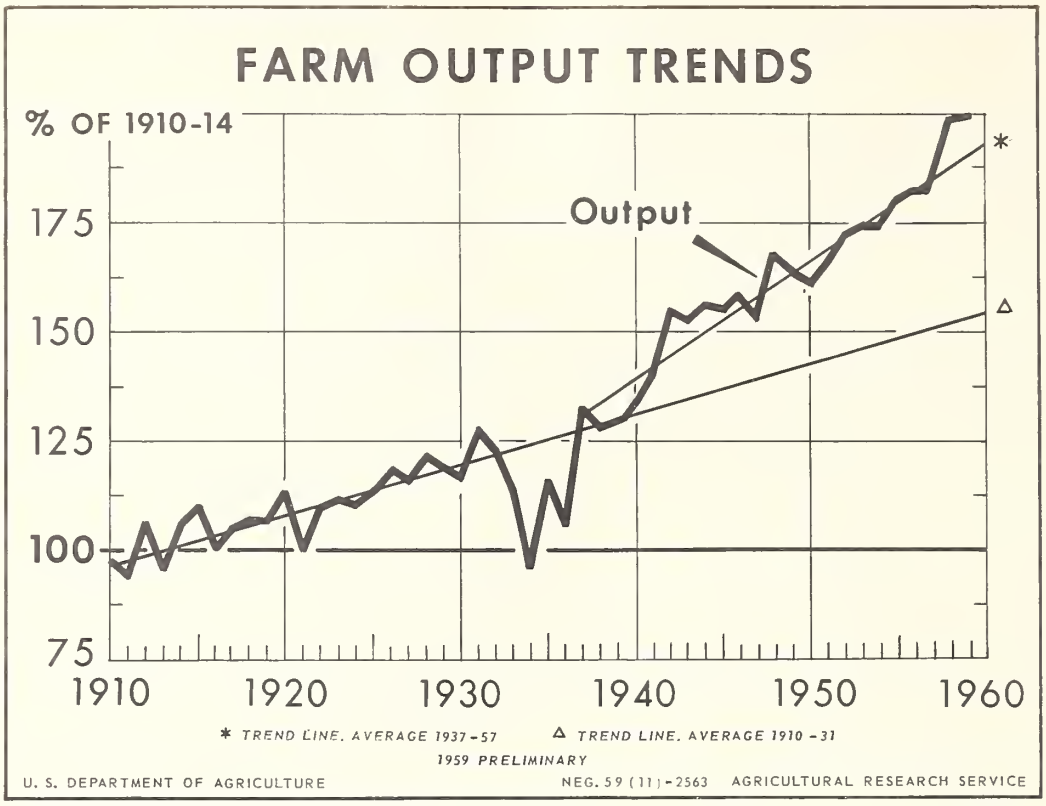

Figure 1

from the peak levels of 1951, and the decline has been accompanied by a substantial rise in cost rates, many farmers have found that adoption of production-increasing techniques would increase incomes by more than the extra costs. When these improvements become a part of the farming system, net incomes are maximized by utilizing fully the increased capacity. In the war and early postwar years, aggregate farm output expanded in response to favorable economic conditions, but the increase has shown little evidence of slackening under the less favorable conditions (fig. 2). Shifts among farm commodities have occurred, but total output has continued its upward climb.

Part of the excess production capacity has been absorbed in the Soil Bank Program since its inception in 1956. The Acreage Reserve part of the Soil Bank Program is not in operation for the crop year 1959, but the Conservation Reserve includes 22.4 million acres of cropland. In view of recent trends in output under the prevailing prices, costs, and farm programs, a much larger acreage would need to be set aside as reserve capacity if this procedure were to be relied upon to avoid adding to stocks. Unless more effective measures are used to restrain production, it would be necessary also to continue the special disposal programs now in operation.

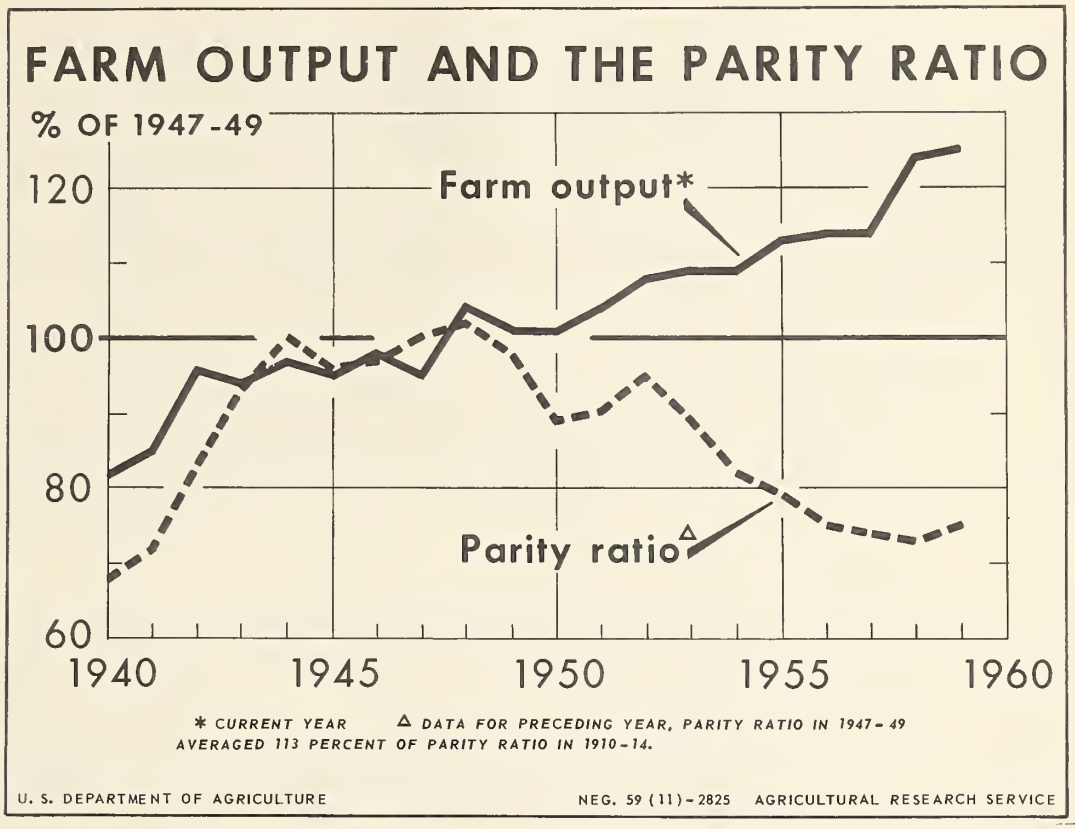

Figure 2

THE WHEAT AND FEED GRAIN SITUATION

Excess capacity is now especially burdensome for wheat and feed grains. Table 1 shows wheat acreage, production, domestic use, exports, and additions to carryover stocks, by years, beginning July 1, 1953. The large wheat acreages harvested from 1951 to 1953 were tapered off with restriction programs beginning in 1954. From 1954 to 1956, production of wheat in the Southern Plains was reduced by drought, as well as by restriction programs. On the market side, special export programs were instituted. Consequently, carryover stocks were reduced in 1955-57. In 1957 and 1958, the wheat acreage was held down by both acreage allotments and the Soil Bank Program. But the exceptionally favorable weather in 1958 resulted in the phenomenal yield of 27.3 bushels per harvested acre and a record crop of nearly 1.5 billion bushels.

From 1954 to 1958, an annual average net addition to carryover stocks of 69 million bushels of wheat was made, despite the reductions in 1955-57. The average addition is equivalent to 2.5 million acres of wheat per year, calculated on the basis of the yields realized on planted acreages for individual years.

Table 1. - Wheat: Acreage, production, disposition, and additions to carryover stocks, 1953-59 1/

Year beginning July 1	Acreage harvested	Production	Domestic use	Exports			Additions to carryover stocks	
				Total	Government programs	For dollars	Total quantity	Acre equivalent 2/
	1,000 acres	Million bushels	Million bushels	Million bushels	Million bushels	Million bushels	Million bushels	Million acres
1953	67,840	1,173	634	217	101	116	328	22.0
1954	54,356	984	611	274	158	116	103	6.6
1955	47,285	935	601	346	241	105	-3	-.2
1956	49,784	1,004	587	550	375	175	-125	-7.5
1957	43,806	951	587	403	250	153	-28	-1.5
1958 3/	53,577	1,462	631	443	310	133	396	15.3
1959 4/	53,217	1,117	626	410	---	---	89	4.7
1954-58:								
Total	248,808	5,336	3,017	2,016	1,334	682	343	12.7
Average	49,762	1,067	603	403	267	136	69	2.5

1/ Data from The Wheat Situation, February 27 and October 23, 1959, and Crop Production, October 10, 1959, AMS-USDA.

2/ Computed from planted yields for individual years.

3/ Preliminary estimates.

4/ Projected estimates for disposition and additions to carryover stocks.

Although the acreage for harvest in 1959 is well within legal acreage allotments and the yield per acre is about in line with recent trends, additions to carryover stocks in 1959 apparently will add the equivalent of about 5 million acres at 1959 yields. This projection is based on estimated exports of 410 million bushels. The wheat acreage would need to be reduced much below the present allotment levels in order to avoid further accumulation of stocks; and a shift from wheat to feed grains would only add to the feed surplus.

Livestock feed is the major outlet for the feed grains. The output of livestock products has increased fairly steadily in recent years, but the market has not been sufficiently attractive to absorb all the current production of feed grains at prevailing price ratios. Consequently, stocks of feed grains have accumulated, as shown in table 2.

Table 2. - Feed grain fed and additions to carryover stocks, 1953 to 1959 1/

Year beginning October	Fed to livestock	Total stocks at end of year	Additions to carryover stocks		
			Total	Percentage of total fed	Acre equivalent 2/
	Mil. tons	Mil. tons	Mil. tons	Pct.	Mil. acres
1953	99.0	31.7	2.4	2.3	2.7
1954	98.9	39.1	7.4	7.5	9.3
1955	106.9	43.3	4.1	3.8	4.9
1956	105.3	48.9	5.6	5.3	6.3
1957	111.5	59.1	10.2	9.1	10.9
1958 3/	124.5	67.4	8.3	6.7	7.7
1959 4/	129.6	80.0	13.6	10.5	13.3
1954-58:					
Total	547.1	---	35.6	6.5	39.1
Average	109.4	---	7.1	6.5	7.8

1/ Includes corn, oats, barley, and sorghum grain. Computed from table 3, page 7, of The Feed Situation, AMS-USDA, November 6, 1959.
2/ Computed from planted yields for individual years.
3/ Preliminary.
4/ Preliminary estimates based on indications in October.

The price distress in egg and broiler production encountered in 1959 and the low hog prices experienced in 1955-56 are indications of definite limits to profitable expansion of livestock production. Production of livestock products cannot proceed much faster than the growth in market demand without encountering severe price declines.

The annual addition to carryover stocks of feed grains has averaged 7.1 million tons for the feeding years 1954 through 1958, as shown in table 2. Computing the acreage equivalent of these additions to carryover the same as for wheat in table 1, we get an average annual acreage equivalent of 7.8 million acres. Apparently, therefore, our annual addition to stocks of wheat and feed grains for the years 1954 through 1958 is equivalent to about 10.3 million acres computed at average realized yields on planted acreages for these crops. Comparable data for 1959, based on current indications, are wheat 4.7 million acres, feed grains 13.3 million acres, and a total of about 18 million acres.

In considering excess capacity in wheat and feed grains, we should recognize that Acreage Reserve and Conservation Reserve Programs of the Soil Bank and the Great Plains Conservation Program have absorbed part of the excess acreage. Estimates made by the Commodity Stabilization Service of the acreages placed in the Soil Bank that would have been used to grow wheat and feed grains are as follows: 1957 - 23 million acres, 1958 - 29 million acres, and 1959 - 14 million acres. Adding these acreages to the acreage equivalent of additions to stocks gives yearly totals of more than 30 million acres. These totals may be considered rough measures of excess capacity in wheat and feed-grain production for the 1957-59 period with the price-cost relationships and the production and disposal programs that were in operation.

IMPORTANCE OF WHEAT, FEED, AND LIVESTOCK IN THE FARM ECONOMY

The great bulk of our farmland is used for wheat, feed grains, forage, and pasture for livestock. Table 3 indicates the percentages of the total cropland and crop acreage equivalent of pasture used for these enterprises. Although other farm products are important and constitute the major enterprises in many farming areas, the wheat, feed grain, and livestock sectors absorb by far the largest acreages of land. About 90 percent of the cropland and hay equivalent of pastureland was utilized for these purposes in 1958.

Feed crops and pasture also function frequently as shock absorbers for other enterprises. For example, if acreages of other cash crops are reduced because of surplus problems and low prices, much of the acreage that

Table 3. - Major crops planted or grown, and hay equivalent of feed from pasture, specified years, 1940-59

Crop or pasture	Average		1958	1959 preliminary	Percentage distribution		
	1940-42	1955-57			1940-42	1955-57	1958
	Mil. acres	Mil. acres	Mil. acres	Mil. acres	Pct.	Pct.	Pct.
Crops:							
Wheat	59	56	57	59	11	11	11
Feed grains:							
Corn	88	78	75	85	16	15	15
Oats	41	45	38	36	8	9	7
Barley	17	16	16	17	3	3	3
Sorghum, all	19	24	21	20	4	4	4
Total (4 feed grains)	165	163	150	158	31	31	29
Hay, all	74	74	73	71	14	14	14
Total (6 crops)	298	293	280	288	56	56	54
Soybeans, all	13	21	25	23	2	4	5
52 other crops	38	30	25	29	7	6	5
Total (59 crops)	349	344	330	340	65	66	64
Pasture (on hay equivalent basis) 1/	191	179	183	2/	35	34	36
Total, crops and pasture 3/	540	523	513	---	100	100	100

1/ Total feed units from pasture divided by feed units per acre of all hay to obtain hay equivalent of pasture.

2/ Not available.

3/ Total of 59 crops planted or grown plus acres of hay equivalent from pasture.

is released is likely to be shifted to feed crops and pasture, and hence into livestock production.

In view of the relative importance of wheat, feed, and livestock in our agriculture, this report considers production prospects for these enterprises in the next several years and relates prospective output to potential outlets.

DEVELOPMENT OF PRESENT AND PROSPECTIVE PRODUCTION CAPACITY

Recent changes in wheat, feed, and livestock production provide a background for appraisal of production prospects because the forces that have been responsible for the recent increases in these products still seem to have unexpended power. Under present production and disposal programs and prevailing price and cost relationships, it may be reasonable to expect continuation of most of the recent trends, unless (1) extremely unfavorable weather is encountered, (2) unforeseen market outlets are developed, or (3) drastic countervailing measures are taken.

In the sections that follow, recent trends in production are examined, and production is projected year by year to 1965, on the basis of these specific conditions:

(1) Continuation of approximately the same price and cost relationships as prevailed in 1958-59.

(2) Continuation of present production and disposal programs, except for expansion of the Conservation Reserve from 22.4 million acres in 1959 to 28 million acres beginning in 1960.

(3) Continuation of approximately the same cropping pattern as in 1959, except for reductions in acreages of some crops to reflect expansion of the Conservation Reserve by about 6 million acres. Table 4 gives the projected cropping pattern for 1960-65 as compared with recent years.

(4) Annual crop production for 1960-65 calculated on the assumption of average weather and an allowance for yield increases based on continued adoption of known production practices. In table 5, the yields of crops under consideration are projected to 1965. See footnote 2, table 5, for explanation of yield projections.

Potential annual production is appraised in relation to possible outlets for the 1960-65 period based on the following assumed conditions:

Table 4. - Harvested acreages of crops, 1947-49, 1954-58, 1958, and 1959, and projections to 1965

Crop	Average		1958 preliminary	1959 preliminary 1/	1960-65 projected 2/
	1947-49	1954-58			
	1,000 acres	1,000 acres	1,000 acres	1,000 acres	1,000 acres
Crops harvested:					
Wheat	74,282	49,762	53,577	53,217	52,745
Feed grains:					
Corn	84,420	76,287	73,470	84,387	83,632
Oats	38,312	35,995	31,826	28,823	28,092
Barley	10,911	14,148	14,876	15,089	14,828
Sorghum grain	6,466	14,034	16,761	15,965	14,541
Total (4 feed grains)	140,109	140,464	136,933	144,264	141,093
Hay	73,101	73,769	73,033	70,991	70,607
Soybeans for beans	10,858	20,177	23,752	21,968	21,760
Cotton	23,893	15,440	11,849	14,991	14,776
Total (8 crops)	322,243	299,612	299,144	305,431	300,981
51 other crops	26,661	26,273	21,930	20,064	20,645
Total (59 crops)	348,904	325,885	321,074	325,495	321,626
59 crops planted or grown	360,262	343,523	330,404	339,616	335,626

1/ Acreage for harvest for corn, oats, barley, hay, wheat, and soybeans for beans from Crop Production, July 10 and October 10, 1959, AMS-USDA.

2/ Assumes expansion of Conservation Reserve to 28 million acres with reduction in harvested acres from 1959 distributed among crops in the same way as estimated normal use of land in Conservation Reserve in 1959, USDA Press Release 387-59.

Table 5. - Yields per harvested acre, 1947-49, 1954-58, 1958 and 1959, and projections to 1965 1/

Item	Wheat	All corn	Oats	Barley	Sorghum grains	4 feed grains	All hay	Soybeans for beans
	Bushels	Bushels	Bushels	Bushels	Bushels	Tons	Tons	Bushels
Average:								
1947-49	16.8	36.3	33.5	25.5	19.2	0.83	1.33	19.9
1954-58	21.4	44.5	37.8	29.2	26.2	.98	1.55	22.0
1958	27.3	51.7	44.7	31.6	36.7	1.15	1.67	24.2
1959 preliminary	21.0	52.5	37.3	27.1	35.9	1.15	1.60	24.1
Projections: 2/								
1960	21.0	49.0	37.5	30.0	30.0	1.09	1.60	22.5
1961	21.4	49.4	37.8	30.4	30.4	1.10	1.62	22.8
1962	21.8	49.8	38.1	30.8	30.8	1.11	1.64	23.1
1963	22.2	50.2	38.4	31.2	31.2	1.12	1.66	23.4
1964	22.6	50.6	38.7	31.6	31.6	1.13	1.68	23.7
1965	23.0	51.0	39.0	32.0	32.0	1.14	1.70	24.0

1/ Historical data from Crop Production, July 10 and November 10, 1959, AMS - USDA.

2/ Projections for 1960-65 made by a committee of Agricultural Research Service scientists. They assumed 1959 acres for harvest as indicated in table 4, and continued adoption of known practices that result in yield increases of individual crops. Rapid increases were projected for sorghum grains because of recent development of hybrid seed. The yield increase for the 4 feed grains combined, however, is projected at a slower rate than recent trends.

(1) Population increases in accordance with series III projections by the U. S. Bureau of the Census for 1960 to 1965 as follows:2/

	Millions
1960	179.8
1961	182.6
1962	185.4
1963	188.1
1964	190.9
1965	193.6

(2) Civilian per capita consumption of meat, milk, poultry, and eggs at preliminary estimates for 1959. This includes 158 pounds of red meat, 36 pounds of poultry, 354 eggs, and 700 pounds of milk or its equivalent in dairy products per person.

(3) Military, export, and other uses of wheat, feed, and livestock products at 1954-58 levels, except that annual wheat exports are projected on two levels - 450 million bushels and 250 million bushels.

Other possibilities are considered also. Among them are:

(1) Continuation of the recent increase in number of cattle and calves to a record high level of 110 million by 1965. 3/ This would mean about 10 pounds more beef per person in 1965 than in 1959.

(2) The feed grain produced above the quantities required to provide livestock and poultry products at 1959 levels of consumption per person and the quantities going into export and other uses, utilized to expand production of hogs. Production from the excess wheat acreage is also considered as livestock feed. The additional production of hogs is expressed in terms of number of pounds of pork available for consumption per person.

2/ Zitter, Meyer, and Siegel, J. S. Illustrative Projections of Population of the United States by Age and Sex, 1960 to 1980. U. S. Bur. Census Series P-25, No. 187, Nov. 10, 1958.

3/ See U. S. Agricultural Marketing Service, Livestock and Meat Situation, May 1959, p. 6.

(3) Some students of corn yields believe that recent trends in yield per acre will be continued for several years under average weather. 4/ Therefore, a further estimate is made of the increase in feed production that would occur if the yields of corn gradually increased to 53 bushels per acre by 1965.

This appraisal is directed toward potential annual production in relation to outlets. The analysis that follows, therefore, does not consider alternative ways of reducing the accumulated stocks of wheat and feed grains.

WHEAT PRODUCTION - TRENDS AND PROSPECTS

Wheat production has fluctuated around a level of 1,100 million bushels a year since 1945, despite reductions in the acreage seeded to wheat (fig. 3). The number of acres planted to wheat decreased from 79 million in 1952 to 59 million in 1959, while the number of acres harvested decreased from 71 million in 1952 to 53 million in 1959, or about one-fourth. Acreage allotment and marketing-quota programs were put into effect in 1954 and have been continued in succeeding years.

Production reached a record high in 1958, although the acreage was about one-fourth below 1952, and the crop is relatively large again in 1959. In fact, wheat production was about 75 percent larger in 1958 and 1959 than in 1939 and 1940, although the harvested acreage was about the same in both periods. Much of the increase can be attributed to favorable weather, but more than half may be due to improved production methods. Although yields per acre have fluctuated greatly, the long-term upward trend has been at a rate of about 0.3 bushels a year. This trend is expected to continue through 1965 (fig. 4).

Additions to carryover stocks of wheat during the last few years resulted chiefly from high yields per acre. The total quantities utilized annually (including exports under special disposal programs) have been at relatively high levels. If it had not been for exceptionally favorable weather in 1958, production from the acreage planted probably would have averaged close to the quantity disposed of in that year.

Table 6 shows the changes in harvested acreage, yield, and production of wheat by regions for the prewar year 1940, the preallotment year 1952,

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4/ See Thompson, L. M., Johnson, I. J., Pesek, J. T., and Shaw, R. H., Jr. Some Causes of Recent High Yields of Feed Grains, in Proceedings, Iowa State College Feed-Livestock Workshop, Ames, Iowa, February 16-18, 1959.

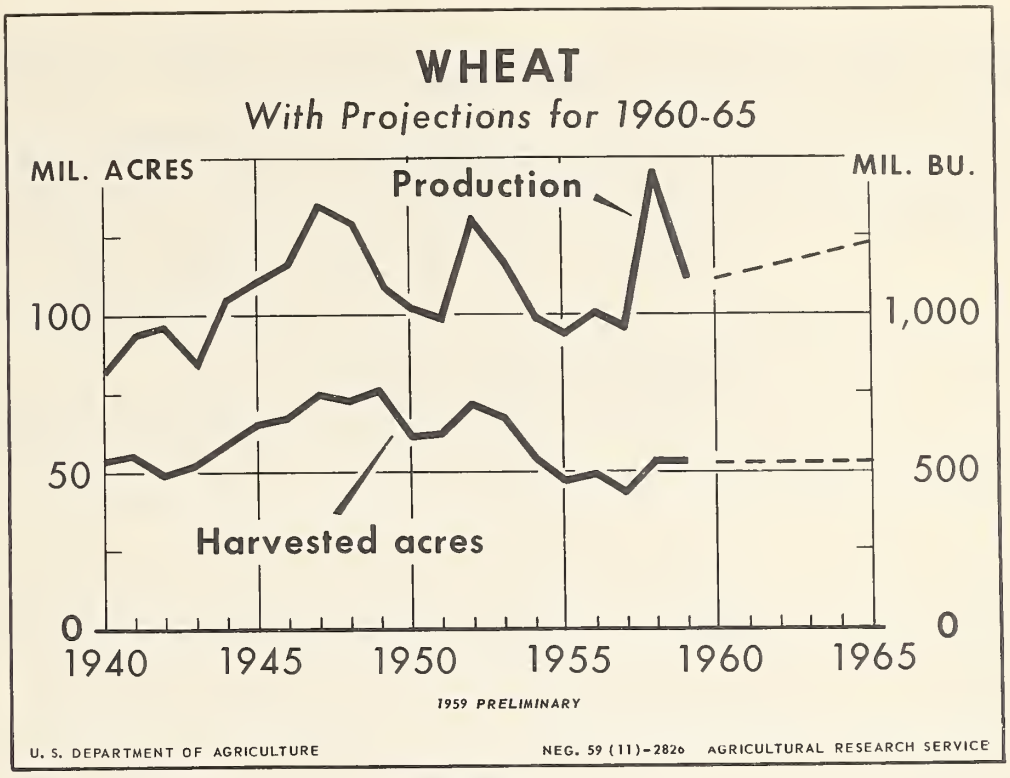

Figure 3

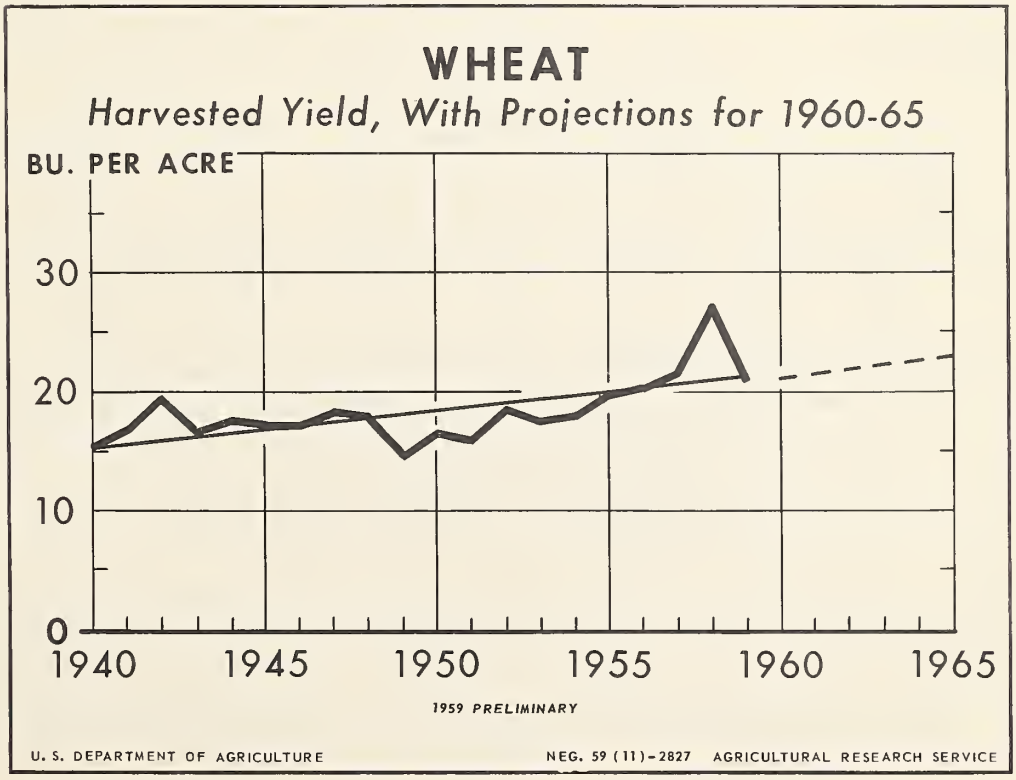

Figure 4

Table 6. - Wheat: Harvested acreage, 1940, 1952 and 1959, and percentage changes, 1952 to 1959 in acreage, yield, and production, by regions 1/

Region 2/	Harvested acreage			Percentage change, 1952-59 3/		
	1940	1952	1959	Harvested acres	Yield per acre	Production
	Million acres	Million acres	Million acres	Percent	Percent	Percent
Northeast	1.7	1.7	1.1	-37	11	-30
Lake States	2.5	2.7	2.2	-17	33	10
Corn Belt	7.1	7.0	6.0	-15	6	-10
Appalachian	1.8	1.3	1.1	-16	14	-4
Southeast and Delta States	.4	.4	.6	61	17	88
Southern Plains	7.2	8.8	7.8	-11	11	-1
Northern Plains	22.1	32.8	22.1	-33	9	-27
Mountain	6.7	11.7	9.1	-22	26	-2
Pacific	3.8	4.7	3.2	-32	24	-16
United States	53.3	71.1	53.2	-25	15	-14

1/ Preliminary data for 1959 from Crop Production, October 10, 1959.

2/ The Northeast includes all States east of Ohio and north of Virginia and Kentucky. The Lake States are Michigan, Wisconsin, and Minnesota. The Corn Belt includes Iowa, Missouri, Illinois, Indiana, and Ohio. The Appalachian region includes Kentucky, Tennessee, Virginia, and North Carolina. The Southeast includes all the States south of Virginia and Tennessee, except Mississippi, which, together with Louisiana and Arkansas, constitutes the Delta region. The Southern Plains States are Oklahoma and Texas; the Northern Plains States are Kansas, Nebraska, South Dakota, and North Dakota. The Mountain States include all States west of the Great Plains region, except the Pacific States of Washington, Oregon, and California.

3/ Based on unrounded data.

and for 1959. Grouping of States by regions is shown in figure 5. The Great Plains, Mountain, and Pacific States harvested 75 percent of the total wheat acreage in 1940, about 82 percent in 1952, and 80 percent in 1959. The Southeast and the Delta States increased their wheat acreages from 1952 to 1959, but they are still negligible. Reductions in acreage from 1952 to 1959 were less than the national average of 25 percent in the Southern Plains, the Corn Belt, and Mountain regions.

In 1952, the harvested wheat acreage in the Mountain States was 75 percent above 1940. In 1959, it was 35 percent above 1940 despite acreage restrictions. The Great Plains and Mountain regions, however, were still overcoming the effects of the drought in 1940, but extensive breaking of sodland in these regions occurred in the high-rainfall years of the 1940's.

Although many changes in wheat acreage have occurred within each region listed in table 6, it is evident that wheat remains concentrated in the Great Plains, Mountain, and Pacific regions. If acreage restrictions were removed, it seems likely that wheat acreage in these regions would return to higher levels than in 1958 and 1959. The extent of the increase would depend on the price and program relationships between wheat and feed grains.

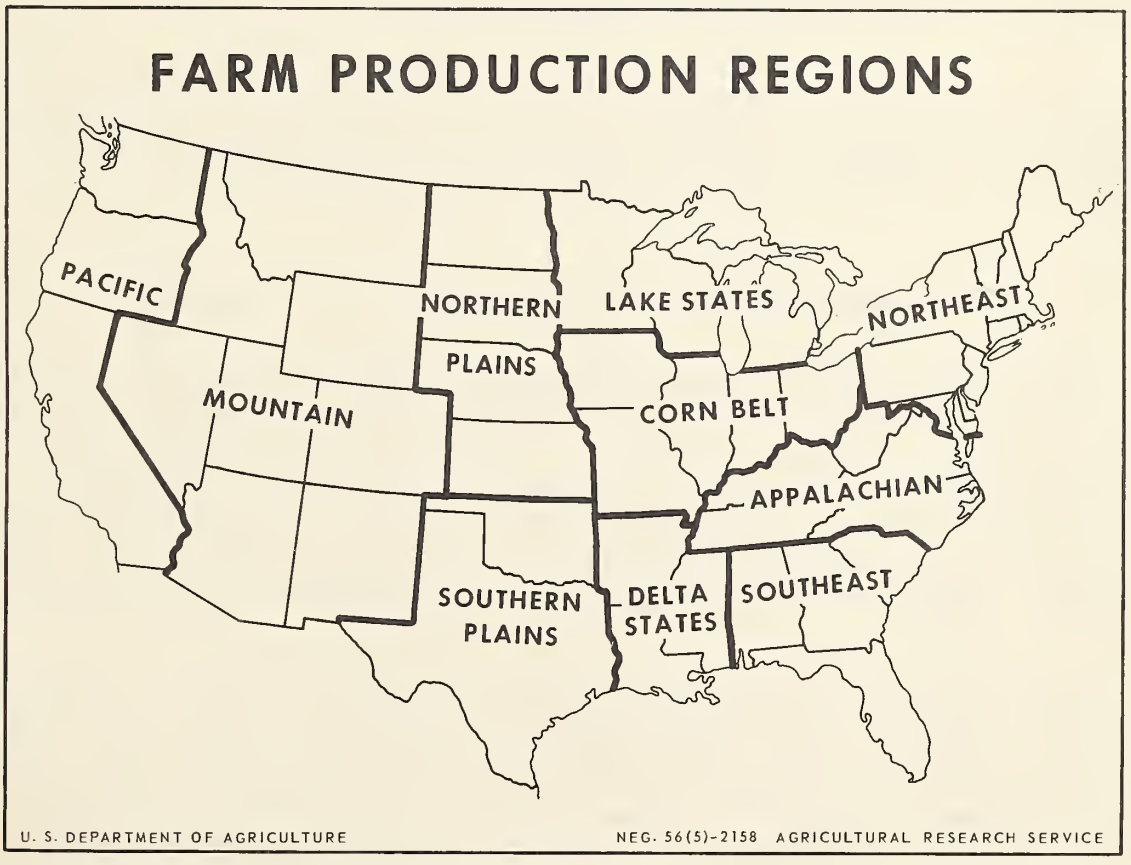

Figure 5

Large-scale shifting of high-hazard wheatland to grass would require special incentives because of the difficulties and expenses encountered in establishing stands of grass on these lands. Income would be deferred during establishment of grass cover.

If the wheat acreage should remain at 1959 levels from 1960 to 1965, except for a reduction of 0.5 million acres due to expansion of Conservation Reserve, and if yields per acre were to increase gradually, as indicated in figure 4, production of wheat would continue to exceed market outlets. Even exports of 450 million bushels would not be sufficient to prevent accumulation of stocks. Table 7 portrays the situation that could be expected with average weather.

Carryover stocks would increase unless annual disappearance amounted to more than 1,075 million bushels. In 1960, only 51 million harvested acres would be needed to supply the relatively large outlets assumed in table 7. In 1965, only 46 million acres would be needed. In 1960, the harvested acreage of wheat would need to be reduced about 2 million acres below that of 1959, and in 1965, nearly 7 million acres below 1959, if production at the projected yields is to be in balance with outlets, unless unfavorable weather should reduce yields below the projected levels.

A lower level of exports than is assumed would mean that a smaller harvested acreage of wheat would be needed. For example, if exports were to decrease to 250 million bushels, the harvested acreage would need to be reduced by an additional 10 or 11 million acres by 1965.

FEED GRAIN PRODUCTION - TRENDS AND PROSPECTS

Total production of the four feed grains - corn, oats, barley, and sorghum grain - has increased greatly in the last few years mainly as the result of higher yields per acre (fig. 6). Feed-grain production in 1959, based on estimates on October 1, was estimated at a record high of 167 million tons or about 70 percent more than in 1940. Total harvested acreage of feed grains averaged about the same in the last few years as in the 1940-42 period. However, harvested yield per acre has gone up greatly (fig. 7).

Acreage allotments for corn were discontinued in 1959, and the total harvested acreage of corn increased from 74 million in 1958 to 84 million in 1959. Total acreage of feed grains increased by 7 million as oats decreased by 3 million. Harvested yield of the four feed grains is estimated at 1.15 tons per acre in 1959 or about the same as in 1958. Despite the large acreage of corn in 1959, record high yields are indicated although

Table 7. - Wheat: Production, supply, and utilization, 1958, 1959, and projections to 1965 1/

Item	Unit	1953-57 average	1958 2/	1959 3/	Projected					
					1960	1961	1962	1963	1964	1965
Harvested acreage	Mil. acres	52.6	53.6	53.2	52.7	52.7	52.7	52.7	52.7	52.7
Yield per acre	Bu.	19.2	27.3	21.7	21.0	21.4	21.8	22.2	22.6	23.0
Production	Mil. bu.	1,009	1,462	1,117	1,108	1,129	1,150	1,171	1,192	1,213
Carryover on July 1	Mil. bu.	904	881	1,277	1,366	1,407	1,469	1,552	1,656	1,781
Imports	Mil. bu.	8	8	8	8	8	8	8	8	8
Total supply	Mil. bu.	1,921	2,351	2,402	2,482	2,544	2,627	2,731	2,856	3,002
Domestic use:										
Food	Mil. bu.	484	493	500	500	500	500	500	500	500
Seed and industry	Mil. bu.	65	66	66	65	65	65	65	65	65
Feed	Mil. bu.	55	73	60	60	60	60	60	60	60
Total	Mil. bu.	604	631	626	625	625	625	625	625	625
Exports	Mil. bu.	358	443	410	450	450	450	450	450	450
Total disappearance	Mil. bu.	962	1,074	1,036	1,075	1,075	1,075	1,075	1,075	1,075
Stocks on June 30, following year	Mil. bu.	959	1,277	1,366	1,407	1,469	1,552	1,656	1,781	1,927
Addition to stocks during year	Mil. bu.	55	396	89	41	62	83	104	125	146
Harvested acreage equivalent of addition to stocks	Mil. acres	2.9	14.5	4.3	2.0	2.9	3.8	4.7	5.5	6.3

1/ Historical data on supply and utilization from The Wheat Situation, AMS-USDA, October 23, 1959, page 2. Projected production assumes 1959 harvested acres and yields as indicated in tables 4 and 5. Data on production for 1959 based on Crop Production, AMS-USDA, October 10, 1959.

2/ Preliminary. 3/ Projected estimates for utilization; other data preliminary.

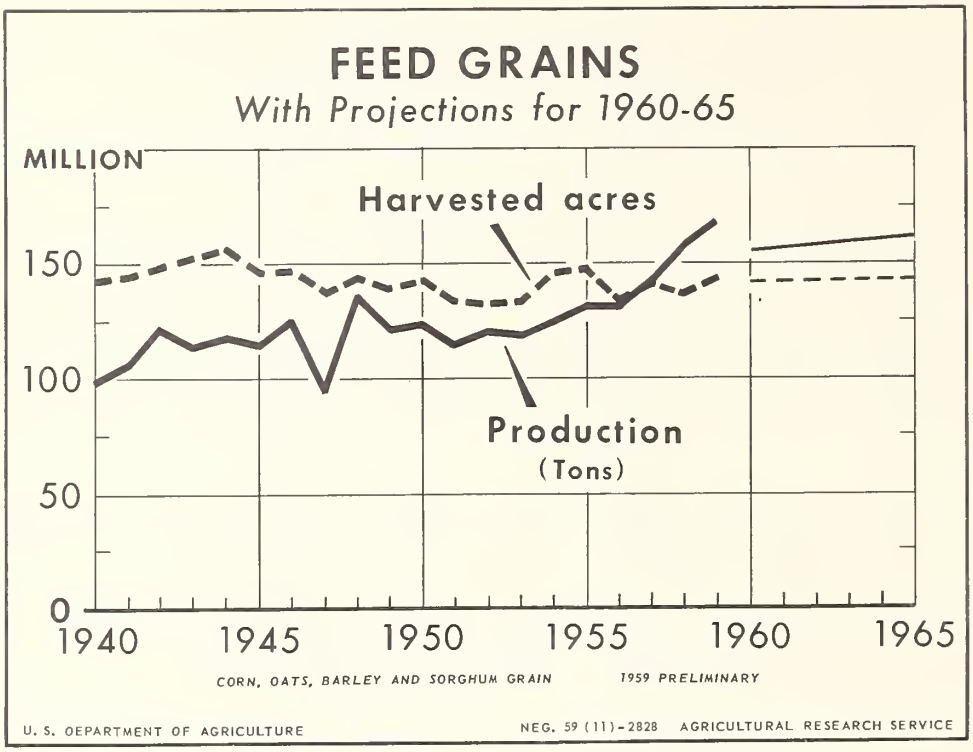

Figure 6

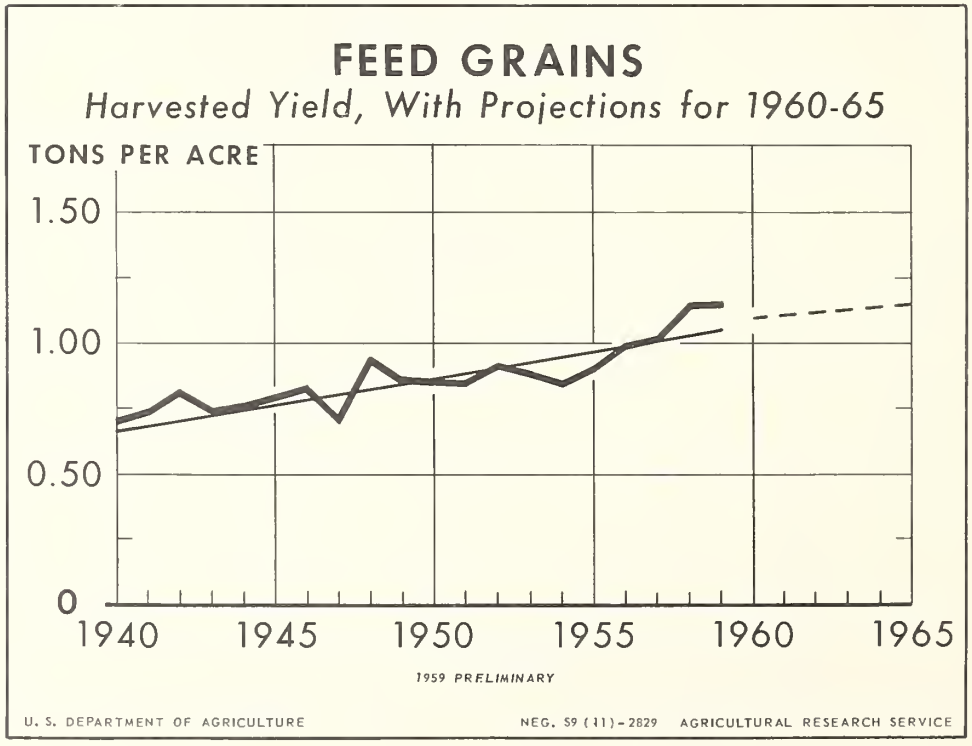

Figure 7

those for sorghum grains, oats, and barley are lower than in 1958. The large acreage in corn tends to raise the yield for the four feed grains as corn has a high yield of grain per acre.

Production of feed grains has gone up much more in some regions than in others since 1953, the last year when acreage allotments for wheat and cotton were not in effect. In the Great Plains, Mountain, and Pacific regions, some land was diverted from wheat to feed grains, but as a partial offset, the feed-grain acreage decreased in other regions (table 8). Higher yields per acre, therefore, were the main sources of higher production in 1957-58 than in 1952-53 when allotments for corn, wheat, or cotton were not in effect.

Production of feed grains has increased in all regions, but more than 60 percent of the national increase from 1952-53 to 1957-58 was in the Southern and Northern Plains, Mountain, and Pacific regions (table 8). These regions harvested 14 million acres more feed grains in 1957-58 than in 1952-53, and in the two Plains regions, the yield per acre increased more than the national average. In 1952-53, however, yields were relatively low in the Plains States.

Table 8. - Feed grains: Changes in harvested acres, yields, and production, by regions, 1952-53 to 1957-58

Region	Percentage change			Actual change	
	Harvested acres	Harvested yields	Production	Harvested acres	Production
	Pct.	Pct.	Pct.	Mil. acres	Mil. tons
Northeast	-4	10	6	-0.2	0.3
Lake States	-7	20	12	-1.3	2.5
Corn Belt	-8	20	10	-3.4	5.4
Appalachian	-13	33	16	-1.1	1.0
Southeast	-10	59	43	-.8	1.7
Delta States	-3	41	37	-.1	.7
Southern Plains	78	62	188	6.0	6.8
Northern Plains	14	31	49	3.9	8.6
Mountain	70	19	102	2.5	2.5
Pacific	67	13	89	1.8	2.1
United States	5	21	27	7.1	31.7

The two Plains regions and the Mountain region had the largest diversion of wheatland to feed grains. From 1952-53 to 1957-58, the acreage of wheat harvested in these three regions decreased by 9 million acres. This reduction was more than offset by an increase of 12 million acres of feed grains.

It may be helpful to look at changes over a longer span of years. Acreage of both feed grains and wheat have averaged lower in 1956-58 than in 1940-42. Higher yields per acre, therefore, account for all of the expansion in production between these two periods. In 1956-58, total acreage of the four feed grains averaged 8 million acres less than in 1940-42, and wheat averaged 4 million acres less than in 1940-42.

Table 9 shows the changes in acreage, yield, and production of feed grains by regions from 1940-42 to 1956-58. Harvested yields of feed grains rose 40 percent, and production increased 33 percent, or 35 million tons from 1940-42 to 1956-58. Production of feed grains has increased in all regions except the Delta States. Higher yields account for less of the expansion in the Pacific region, where acreage expansion is more important. The weather was unusually favorable in 1958, but this was also true of 1942. Therefore, changes in crop yields from 1940-42 to 1956-58 are due mainly to factors other than variations in weather.

Table 9. - Feed grains: Changes in harvested acres, yields, and production, by regions, 1940-42 to 1956-58

Region	Percentage change			Actual change		Percentage of total production, 1956-58
	Harvested acres	Harvested yields	Production	Harvested acres	Production	
	Pct.	Pct.	Pct.	Mil. acres	Mil. tons	Pct.
Northeast	-9	40	27	-0.5	1.2	4.0
Lake States	2	37	40	.4	6.5	15.9
Corn Belt	1	29	30	.5	13.8	41.8
Appalachian	-27	49	9	-2.8	.6	5.4
Southeast	-31	109	44	-3.4	1.7	3.8
Delta States	-49	51	-23	-3.4	-.7	1.8
Southern Plains	-9	56	42	-1.2	2.6	6.0
Northern Plains	0	33	33	0	5.4	15.2
Mountain	21	45	76	1.0	1.9	3.1
Pacific	62	40	126	1.7	2.4	3.0
United States	-5	40	33	-7.9	35.4	100.0

Higher yields of feed grains have resulted from a combination of factors such as (1) shifts to higher yielding feed grains and to better quality land, (2) use of more fertilizer, (3) development of higher yielding varieties, and (4) improved cultural practices.

Shifts in Land Use

From 1940-42 to 1956-58, the total acreage of feed grains changed very little in the Corn Belt and Lake States. But a shift from oats and barley to corn contributed to higher average yields of feed grains in these regions. In the Corn Belt, the harvested acreage of corn increased by 4 million acres, or about 10 percent, while that of oats and barley decreased by about 4 million acres. In the Corn Belt and Lake States, the total acreage of corn was 8 million more in 1959 than in 1958.

Major shifts in land use occurred in the South. Since 1940, the total acreage of harvested crops has decreased by 25 million acres, or about a fourth. From 1940-42 to 1956-58, the acreage of corn decreased by 15 million acres and that of cotton by 8 million acres. Part of the rise in yields of feed grains in the South may have been the result of shifting land formerly in cotton to feed grains.

Table 10 shows the percentage changes in harvested acres, yields, and production of corn in the various regions from 1940-42 to 1956-58. Sharp reductions in acreage occurred in all Southern States, as well as in the Mountain States. Except for the Delta and Southern Plains States, the reduction in acreage was more than offset by higher yields per acre. The acreage of corn increased during this period in the Pacific, Corn Belt, and Lake States. The Corn Belt and Lake States accounted for a higher percentage of total corn production in 1956-58 than in 1940-42. More than two-thirds of the corn was grown in these two regions in 1956-58, and more than half of it was grown in the Corn Belt.

In the two Great Plains regions, the harvested acreage of corn and oats decreased by 6.7 million acres, while that of sorghum for grain increased by 7.5 million acres from 1940-42 to 1956-58. Sorghum for forage decreased by about 8 million acres, and probably much of the land that was formerly used to grow this crop has been shifted to sorghum for grain. The total acreage of land used for crops in the Great Plains has decreased by about 4 million acres since 1940. The decrease occurred in the Southern Plains but was partly offset by an increase in the Northern Plains.

Expansion of feed grain acreage in the Mountain and Pacific regions accompanied an increase in the total acreage of all crops harvested in these

Table 10. - Corn: Percentage changes in harvested acres, yields and production, and percentage distribution of production, by regions, 1940-42 to 1956-58

Region	Percentage change			Percentage distribution of production	
	Harvested acres	Harvested yields	Production	1940-42	1956-58
	Percent	Percent	Percent	Percent	Percent
Northeast	-3	37	33	4.2	4.3
Lake States	24	37	69	12.5	16.2
Corn Belt	7	27	36	49.5	51.5
Appalachian	-35	57	3	8.7	6.9
Southeast	-33	217	46	4.3	4.8
Delta States	-59	60	-34	4.0	2.0
Southern Plains	-69	24	-61	4.1	1.2
Northern Plains	-10	43	28	11.5	11.3
Mountain	-41	247	46	1.0	1.1
Pacific	98	215	325	.2	.7
United States	-14	53	31	100.0	100.0

regions. Total crop acreage went up by nearly 4 million acres, or about 10 percent, while the combined acreages of feed grains, mainly barley, increased by nearly 3 million acres from 1940-42 to 1956-58.

Use of More Fertilizer

In general, crop production has become more concentrated in areas of better quality land, where production response to larger applications of fertilizer, better varieties of crops, and improved cultural practices, are relatively large. Examples of such shifts are the reduction in harvested acreages of crops in the South, where yields have been relatively low, and the offsetting expansion of acreage in the irrigated areas of the West.

Nearly four times the quantity of plant nutrients in commercial fertilizer, and six times as much nitrogen were applied to crops in 1958 as in 1940. Use of fertilizer expanded in all regions, but the greatest increase

was in the Corn Belt. The Corn Belt accounted for 25 percent of all plant nutrients applied in 1958, as compared with 11 percent of a smaller total in 1940 (table 11).

Table 11. - Total plant nutrients and nitrogen used on farms, by regions, 1940, 1950, and 1958 1/

Region	Total plant nutrients			Nitrogen		
	1940	1950	1958	1940	1950	1958
	1,000 tons	1,000 tons	1,000 tons	1,000 tons	1,000 tons	1,000 tons
Northeast	328	545	659	52	93	149
Lake States	63	331	602	6	33	123
Corn Belt	182	814	1,570	17	117	414
Appalachian	405	824	855	72	180	234
Southeast	472	849	1,049	138	231	334
Delta	113	342	392	53	164	215
Southern Plains	25	166	287	7	35	154
Northern Plains	6	80	264	2/	26	153
Mountain	12	75	189	1	30	113
Pacific	73	262	491	33	156	344
United States	1,679	4,288	6,358	379	1,065	2,233

1/ Data for calendar years except for 1958, which is for year ending June 30.

2/ Less than 1,000 tons.

Much of the additional fertilizer has been applied to feed grains. Nearly 45 percent of all plant nutrients now used on crops in the United States are applied to feed grains. The percentages of all plant nutrients used that were applied to corn, oats and barley, in 1947 and 1954, are as follows:

	1947	1954
N	32	45
P_2O_5	32	41
K_2O	36	44

Increases in the quantities of plant nutrients used on corn, oats, and barley from 1947 to 1954 were as follows: 208 percent for nitrogen, 55 percent for phosphoric acid, and 148 percent for potassium.

Despite rapid increases in use, applications of fertilizer to feed grain crops are still lower than the most profitable levels on many farms. In 1954, fertilizer was applied to only 60 percent of the corn and 30 percent of the oats and barley. Application rates on acres fertilized averaged 27 pounds of nitrogen per acre for corn as compared with recommendations of at least twice that amount in most areas.

Other Improved Practices

Development and adoption of hybrid corn and sorghum grain also contributed to higher yields. Probably the main effect of improvement in varieties of oats and barley has been to maintain yields.

About 30 percent of the corn acreage was planted to hybrid seed in 1940, as compared with 80 percent in 1950 and 95 percent in 1959. Hybrid varieties of sorghum first became important in 1957 and perhaps half the acreage of grain sorghum was planted to hybrid varieties in 1958. In Kansas, two-thirds of the grain sorghum was planted with hybrid varieties in 1959 as compared with a little less than half in 1958. Further rapid increases are expected in the next year or two.

Other practices that have contributed to higher yields of feed grains include better weed control, heavier planting rates for corn, and improved tillage.

Yield Increases Likely to Continue

The yields per acre of feed grains are expected to continue to increase in the years 1960 to 1965. But the annual rates of increase may be less for corn and sorghum grain in the next 5 years than in the years since 1940. The yield projections for 1960-65 shown in figures 8 and 9 are those that Agricultural Research Service scientists expect to result from further application of known improvements in these years. They assume 1959 acreages for individual crops, except for some reduction in harvested acres due to expansion of the Conservation Reserve Program. Average weather is assumed. Because of exceptionally favorable weather, actual yields were higher in 1958 than those indicated by the long-term trendlines for that year.

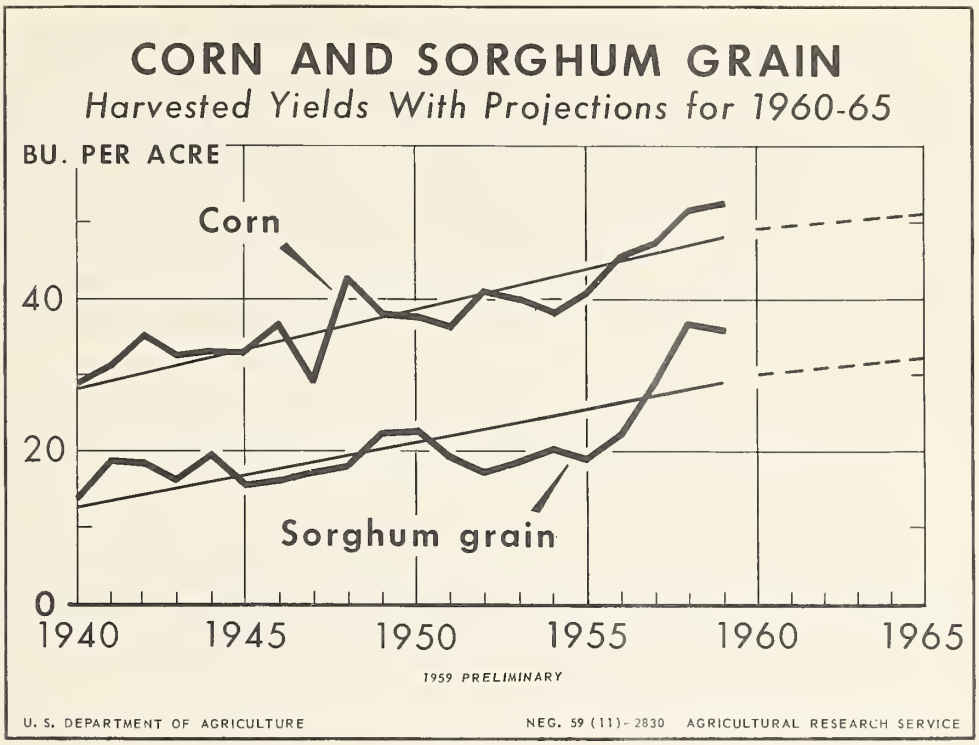

Figure 8

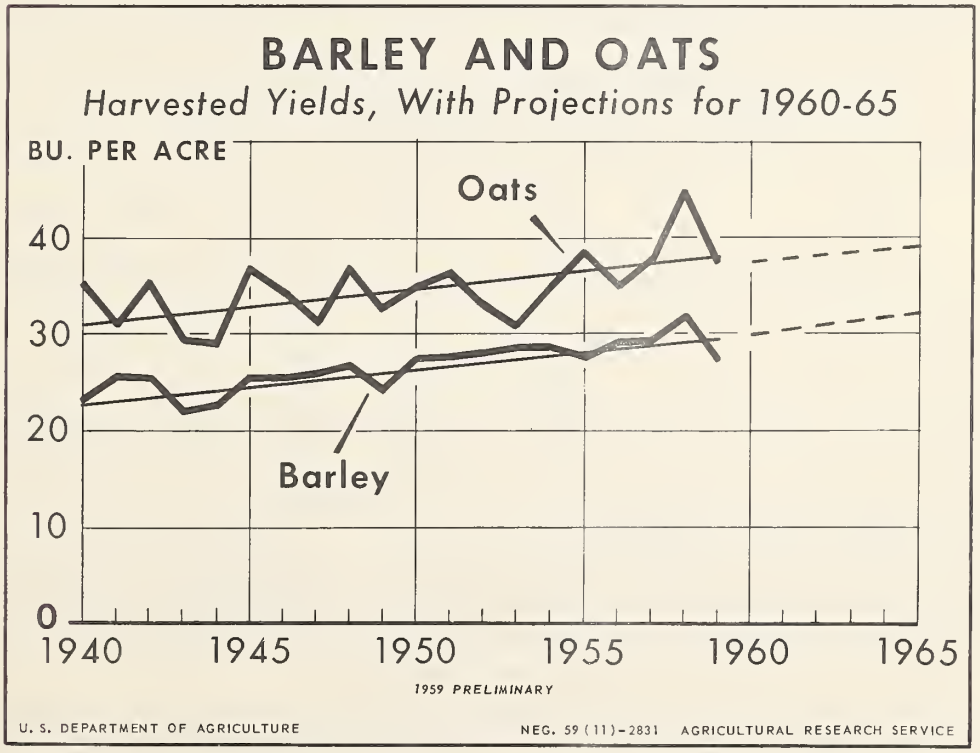

Figure 9

Corn yields could increase more than the projection shown in figure 8, especially if additional farmers were to apply as much fertilizer as would be profitable under present price-cost relationships. One estimate indicates that if fertilizer applications on corn were increased to the point at which $1.00 of additional fertilizer gave a marginal return of $2.00 of corn at present prices, and 75 percent of the total acreage of corn were fertilized at this rate, the national harvested yield of corn might average about 59 bushels (table 12). Rates of plant nutrients applied per acre fertilized would be about 60 pounds of nitrogen, 50 pounds of P_2O_5, and 60 pounds of K_2O. Other improved practices would need to be combined with more fertilizer. In view of these data, apparently continuation of recent yield trends is possible. This would mean a harvested yield of 53 bushels per acre as compared with the 51 bushels projected for 1965 in table 5 and figure 8.

Yields of sorghum grain are expected to increase chiefly as a result of additional plantings of improved hybrid varieties. However, the projected rate of increase in figure 8 is less than the rapid rate that has prevailed since hybrid seed became available. Also, projected yield increases are lower for oats and barley than for corn and sorghum grain.

When the yields per acre of the four feed grains are combined, as in figure 7, it is evident that the increase for 1960-65 is projected at a much lower rate than the rate of increase realized in recent years. In fact, the projected rate of increase is only about half that experienced since 1940.

Table 12. - Corn yields and fertilizer applied to corn, estimates for specified years, 1947-58, and possible in 1965

Item	Unit	1947	1950	1954	1958 1/	Possible in 1965 2/
Acreage fertilized	Percent	44	48	60	65	75
Nitrogen per acre	Pound	10	15	27	32	3/ 60
Yields	Bushel	28.4	37.6	38.8	51.7	---
1940-58 trend	do.	36	39	43	47	4/ (59)

1/ Unpublished and preliminary.

2/ From Ibach, D. B. and Lindberg, R. C. The Economic Position of Fertilizer Use in the United States, U. S. Dept. Agr. Agr. Inform. Bul. 202, 1958.

3/ Number pounds per acre fertilized estimated to result in a marginal return of $2.00 for $1.00 of additional fertilizer.

4/ Estimated yield per harvested acre if 75 percent of the acreage were fertilized at a rate to result in a marginal return of $2.00 for $1.00 of additional fertilizer.

Higher Production in Prospect

Except for reductions due to expansion of the Conservation Reserve Program, continuation of the 1959 acreage of feed crops, together with the projected yields indicated above, would result in a total feed-grain production of 161 million tons by 1965. This would be about 3 million tons more than that produced in 1958 but about 6 million tons less than the record quantity estimated for 1959 (fig. 6). Production of feed grains would increase at the same rate as yields per acre during the 1960-65 period, or about 1 percent a year.

Production of feed grains would exceed utilization projected to provide for continuation of 1959 consumption rates of livestock products for the population expected in 1960-65 and annual exports of 10 million tons (table 13). If concentrates fed per grain-consuming animal unit average 0.85 ton as compared with 0.81 in 1953-57 and 0.90 in 1958, additions to stocks of feed concentrates would total about 13 million tons each year and represent production from about 12 million harvested acres of feed grains.

If yields of corn increase in 1960-65 at the same rate as during the 1940-59 period, production of feed grains would total about 5 million tons larger than the 161 million tons indicated above for 1965 or the equivalent of about 5 million harvested acres of feed grains. The possibility of adverse weather and much lower yields of feed grains, especially for single-crop years should be considered also. In 1947, for example, the yield per harvested acre of corn dropped 16 percent below the average of 1944-46. This experience, as well as the recurring droughts in the Great Plains, are reminders that we have not succeeded in developing a weatherproof agriculture.

ROUGHAGE FEED PRODUCTION - TRENDS AND PROSPECTS

Hay

Production of hay has increased in recent years, largely because of higher yields per acre. There have been large carryover stocks in many areas. Stocks on hand on May 1, 1959, were equivalent to about a fourth of the quantity utilized annually. The harvested acreage of hay has averaged around 72 million acres in recent years. This is about the same acreage as during the years around 1940, but about 3 million acres less than during the 1943-55 period (fig. 10).

Although the total acreage of hay has not changed much since 1940, its distribution among regions has changed (table 14). The acreage of hay has

Table 13. - Feed concentrate supply and utilization for year beginning October, 1953-57 average, 1957 and 1958, and projections to 1964 1/

Item	1953-57 average	1957	1958 2/	Projected estimates 3/					
				1959 4/	1960	1961	1962	1963	1964
	Million tons	Million tons	Million tons	Million tons	Million tons	Million tons	Million tons	Million tons	Million tons
Supply:									
Stocks beginning of year	38.0	48.9	59.1	67.4	80.0	89.9	103.2	116.6	129.8
Production of feed grains:									
Corn	91.7	95.8	106.4	124.0	114.7	115.7	116.6	117.5	118.5
Oats	20.9	20.8	22.8	17.2	16.9	17.0	17.1	17.3	17.4
Barley	8.8	10.5	11.3	9.8	10.7	10.8	11.0	11.1	11.2
Sorghum grain	7.6	15.8	17.2	16.1	12.2	12.4	12.5	12.7	12.9
Total production	129.0	142.9	157.7	167.1	154.5	155.9	157.2	158.6	160.0
Imports of feed grain	1.1	1.0	.4	.7	1.0	1.0	1.0	1.0	1.0
Wheat and rye fed	1.8	1.6	2.3	1.9	1.5	1.5	1.5	1.5	1.5
Byproduct feeds	24.4	25.9	27.1	27.4	27.4	27.6	27.8	27.9	28.1
Total supply	194.3	220.3	246.6	264.5	264.4	275.9	290.7	305.6	320.4
Utilization:									
Food, industry and seed	12.4	12.4	12.7	12.6	12.5	12.5	12.5	12.5	12.5
Exports	7.2	10.5	12.8	13.0	10.0	10.0	10.0	10.0	10.0
Livestock feed	130.9	139.7	153.8	159.0	152.0	150.2	151.6	153.3	154.9
Total utilization	150.5	162.6	179.3	184.6	174.5	172.7	174.1	175.8	177.4
Utilization on crop-year basis	149.9	161.2	179.2	184.5	174.5	172.7	174.1	175.8	177.4
Stocks at end of crop year	44.4	59.1	67.4	80.0	89.9	103.2	116.6	129.8	143.0
Other items:									
Grain-consuming animal units -- millions	161.4	161.5	171.0	176.0	174.7	176.7	178.3	180.3	182.2
Concentrates fed per animal unit -- tons	.81	.87	.90	.90	.87	.85	.85	.85	.85
Addition to stocks during year -- tons	6.4	10.2	8.3	12.6	9.9	13.3	13.4	13.2	13.2
Acre equivalent of addition to stocks -- million acres	6.4	10.1	7.2	11.0	9.1	12.0	12.0	11.7	11.6

1/ Historical data from The Feed Situation, AMS-USDA, November 6, 1959, table 2. 2/ Preliminary. 3/ Production of feed grains assumes acres and yields indicated in tables 4 and 5. Production of byproduct feed is estimated to increase slightly with larger acreage of cotton and higher yields for soybeans. Utilization of livestock feed are quantities required to provide 1959 consumption rates of livestock products per person for the expected population in 1960-65.

4/ Preliminary estimates based on indications in October.

Table 14. - Hay: Percentage change in harvested acres, yields, and production, 1940-42 to 1956-58, and percentage distribution of 1956-58 average production, by regions

Region	Percentage change			Percentage distribution of production 1956-58
	Harvested acres	Harvested yields	Production	
	Percent	Percent	Percent	Percent
Northeast	-18.6	22.5	-0.3	11.2
Lake States	-13.3	23.2	6.8	16.3
Corn Belt	-14.9	27.6	8.6	19.7
Appalachian	-7.8	15.6	6.5	7.1
Southeast	-35.6	56.1	.5	1.8
Delta States	-23.2	10.3	-15.3	2.4
Southern Plains	16.3	1.4	17.9	3.2
Northern Plains	60.0	14.5	83.2	17.5
Mountain	8.1	16.3	25.7	11.8
Pacific	1.2	16.9	18.2	9.0
United States	-.6	18.0	17.4	100.0

increased in the Western States but has decreased quite generally in the East and South. Yields have increased in all regions, and production has gone up except in the Delta States and the Northeast.

As estimated by scientists of the Agricultural Research Service, hay yields are expected to increase gradually in 1960-65 (fig. 11). These yields, together with a harvested acreage a little below that of 1959 to allow for expansion of the Conservation Reserve, would mean expansion of hay production by 1965 to about the record level achieved in 1958. There should be enough hay to provide for expansion in the total number of roughage-consuming livestock at a rate slightly higher than the upward trend in 1945-59. In fact, it would be possible by 1965 to feed 11 percent more roughage-consuming livestock than were on farms in 1959 at the 1953-57 average rate of 1.16 tons per roughage-consuming animal unit.

Pasture

Pasture provides about two-thirds of all the roughage feed consumed by livestock. Feed available from pasture, therefore, may affect considerably

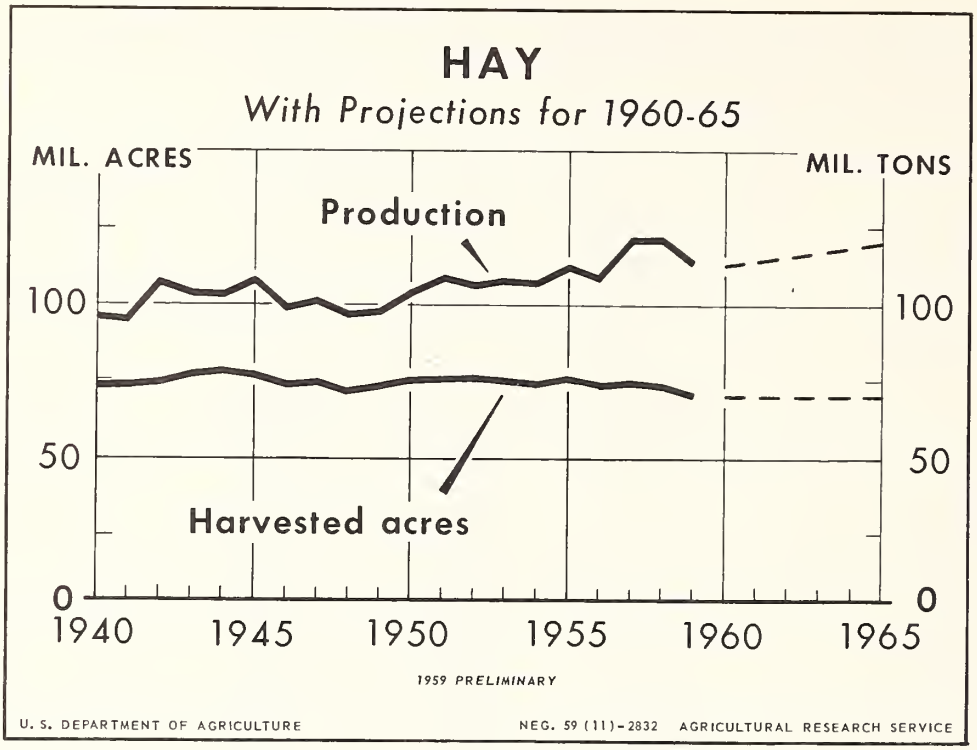

Figure 10

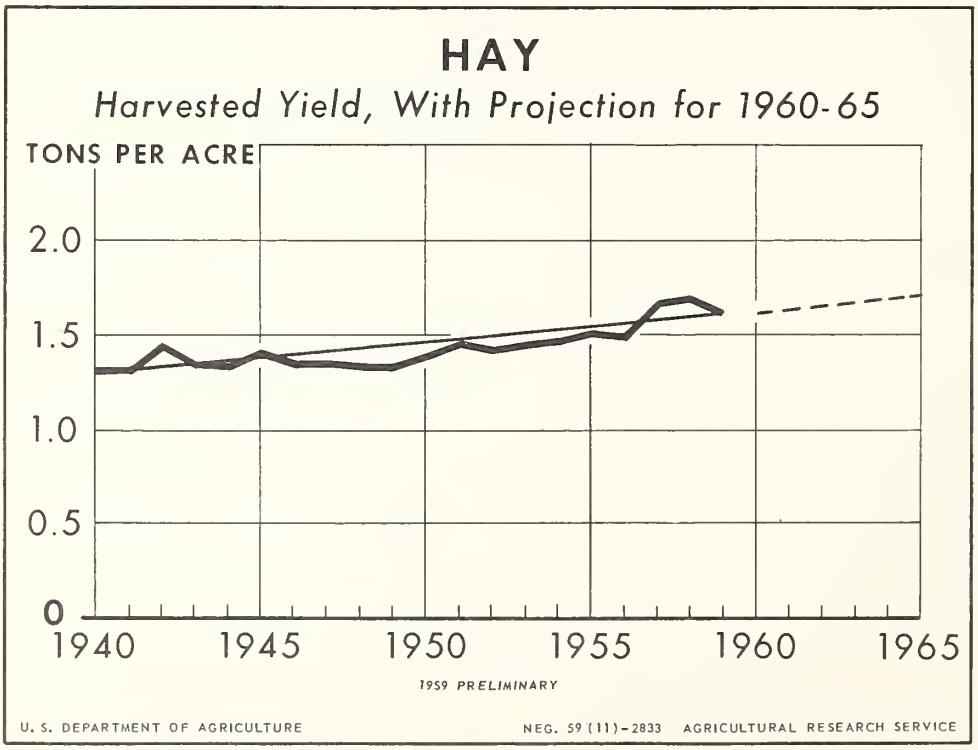

Figure 11

the number of roughage-consuming animals kept on farms and ranches. The estimated quantity of feed consumed from pasture has fluctuated widely from one year to the next, depending upon available supplies of hay and other harvested roughages and the number of cattle and sheep on hand, as well as the weather. Feed consumed from pasture, for example, increased from 1940 to 1945 and again from 1950 to 1955 when cattle numbers were increasing (fig. 12).

Despite wide fluctuations, the long-term trend in feed consumed from pasture has been upward as pastures have been improved. This trend is expected to continue. Feed units available from pasture may total 131 million tons by 1965, or about 15 percent more than the average for the 1953-57 period, and about 5 percent more than was consumed in the 1957-58 feeding year (table 15). This would mean that about 15 percent more roughage-consuming units than we had in 1953-57 could be maintained at the 1953-57 rate of feed consumption from pasture.

If the feed available from pasture increases as projected in table 15, about 108 million roughage-consuming animal units could be maintained on the pasture available in 1965. About 98 million roughage-consuming units would maintain 1959 per capita consumption of animal products. If cattle numbers should increase to 110 million, the roughage-consuming units would total 107 million. Such an increase in cattle numbers would mean somewhat less feed per roughage-consuming unit available from pasture than in 1957 but slightly more than the average for 1953-57.

Table 15. - Feed consumed from pasture, and number of roughage-consuming animal units, 1953-57 average, 1957, and projected 1964

Item	Unit	Year beginning Oct. 1		
		1953-57 average	1957	1964 projected
Feed units consumed or available from pasture	Mil. tons	114	125	131
Roughage-consuming animal units on pasture	Mil.	94	92	1/ 108
Feed units from pasture per roughage-consuming animal unit	Ton	1.21	1.36	1.21

1/ Projected number of roughage-consuming animal units shown is the number that could be provided with 1.21 tons of feed units from the projected 131 million tons of feed available from pasture in 1964-65. About 98 million units would need to be maintained to provide 1959 levels of meat consumption.

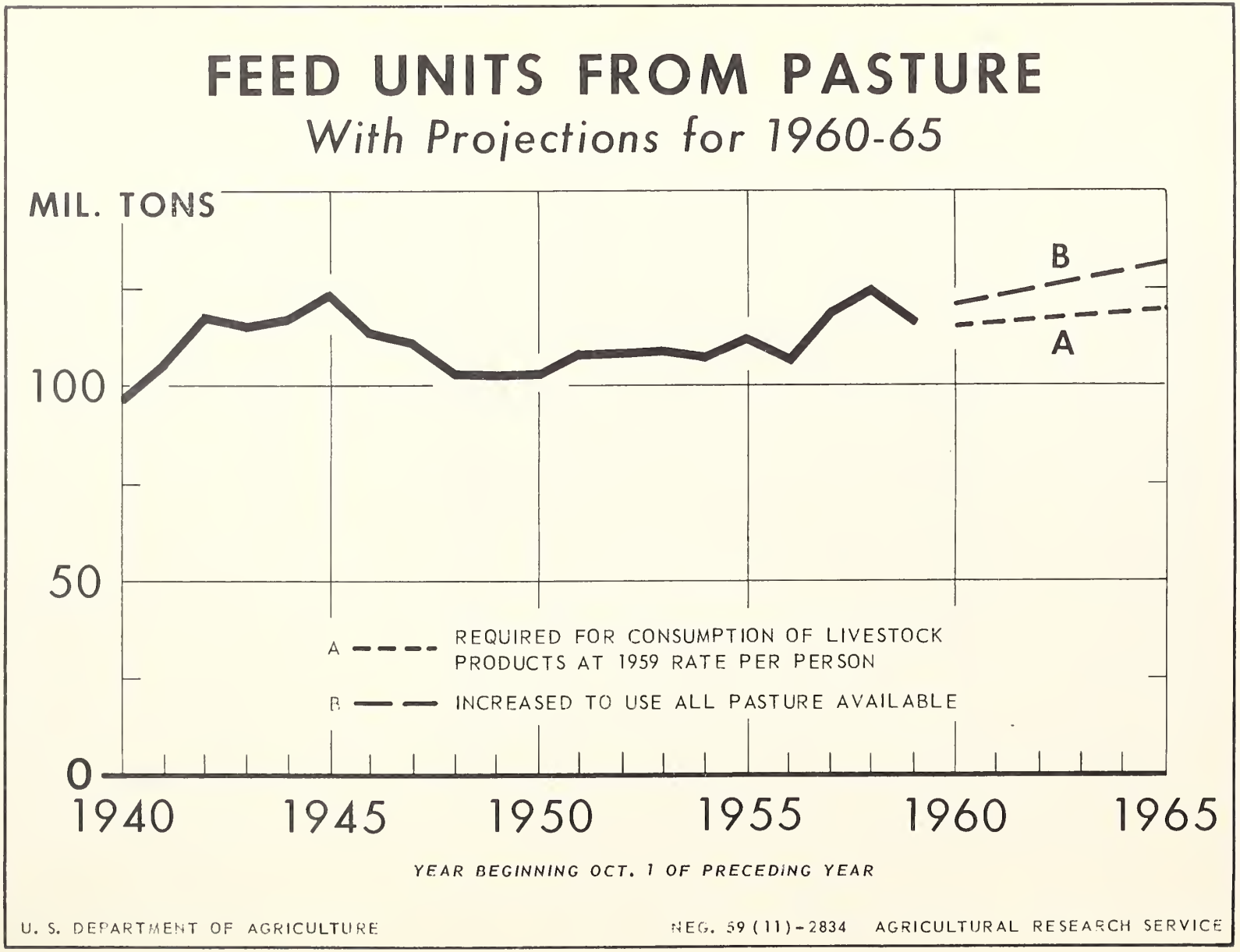
FEED UNITS FROM PASTURE
With Projections for 1960-65
MIL. TONS
100
50
0
B
A
A ---- REQUIRED FOR CONSUMPTION OF LIVESTOCK PRODUCTS AT 1959 RATE PER PERSON
B — — INCREASED TO USE ALL PASTURE AVAILABLE
1940
1945
1950
1955
1960
1965
YEAR BEGINNING OCT. 1 OF PRECEDING YEAR
U. S. DEPARTMENT OF AGRICULTURE
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Figure 12

We must recognize, however, that these computations are based on average weather. Severe drought, especially in the Great Plains and Mountain regions would reduce drastically the feed available from pasture and cause liquidation of cattle and sheep.

Other Roughages

Such roughages as silage, beet pulp, corn stover, and straw provide about 5 percent of all the roughage feed consumed by livestock. The total number of feed units supplied from these sources has changed little since 1940, but the composition of these other roughage feeds has changed greatly. Silage has nearly doubled in volume since 1940, while volumes of corn stover and straw have decreased by nearly half. Silage, which is one of the better quality roughage feeds, has become a relatively more important source of the roughage feed supply in recent years; probably its production will continue to expand in the next few years.

LIVESTOCK PRODUCTION - TRENDS AND PROSPECTS

If production of concentrates, roughage, and pasture approximate the projections for 1960-65 that were made in the foregoing sections, ample feed supplies will be available from current production for substantial increases in output of livestock products. Also, some reduction in feed consumption per unit of product is possible if more efficient feeding methods are adopted. The analysis that follows, however, is based on recent inputs of feed per unit of product.

Figure 13 shows the trend in numbers of both grain-consuming and roughage-consuming animal units of livestock from 1939 to 1959. Projections of numbers for 1960 to 1965 are made on two bases. The "A" projection indicates the numbers that would be required to maintain 1959 per capita consumption of animal products. These rates of consumption are shown in table 16 in comparison with recent years. The increase shown in the A projection, therefore, is geared to the anticipated increase in population. The "B" projection, however, indicates numbers that would be maintained if all the feed produced from 1960 to 1965 were utilized by livestock including poultry. The additions to carryover stocks of wheat shown in table 7 also are included as feed. The latter projection assumes expansion in the total number of cattle and calves to 110 million (fig. 14). Dairy cattle and poultry are included at the same levels as in the A projection.

The feed produced in the years 1960-65, therefore, would be utilized as follows under the B projection: (1) Dairy cattle and poultry would use

Table 16. - Apparent civilian per capita consumption of livestock and poultry products, 1947-49 and 1954-58 averages, 1958, and 1959 1/

Item	1947-49 average	1954-58 average	1958	1959 preliminary
	Pounds	Pounds	Pounds	Pounds
Meats (carcass weights):				
Beef	65.6	82.5	80.5	81.0
Veal	9.7	8.9	6.7	5.8
Lamb and mutton	4.8	4.4	4.1	4.5
Pork (excluding lard)	68.4	63.3	60.7	67.0
Total	148.5	159.1	152.0	158.3
Poultry (ready-to-cook):				
Chicken, total	18.7	24.5	28.3	29.8
Broilers	5.6	17.3	22.1	23.7
Other	13.1	7.2	6.2	6.1
Turkey	3.3	5.1	5.8	6.0
Total	22.0	29.6	34.1	35.8
Meats and poultry	170.5	188.7	186.1	194.1
Eggs	48.8	47.5	45.6	46.3
Meat, poultry, and eggs	219.3	236.2	231.7	240.4
Total milk 2/	742	700	692	687

1/ Data from National Food Situation, AMS-USDA, Nov. 5, 1959. Estimates for 1959 are based on conditions through Oct. 1959.

2/ Milk equivalent on fat-solids basis.

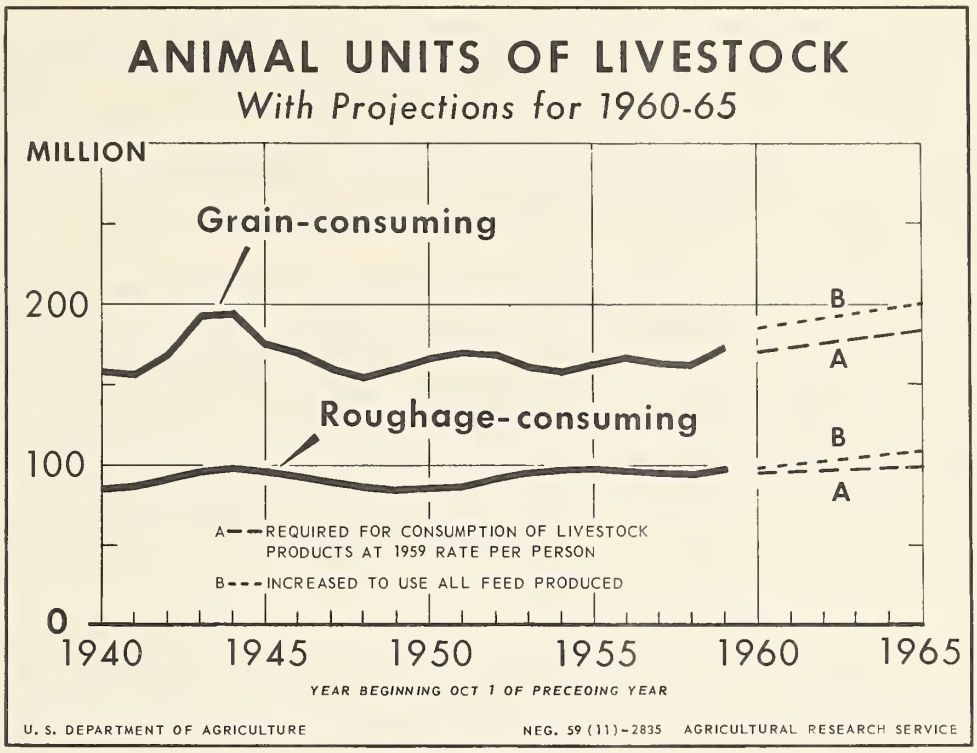

Figure 13

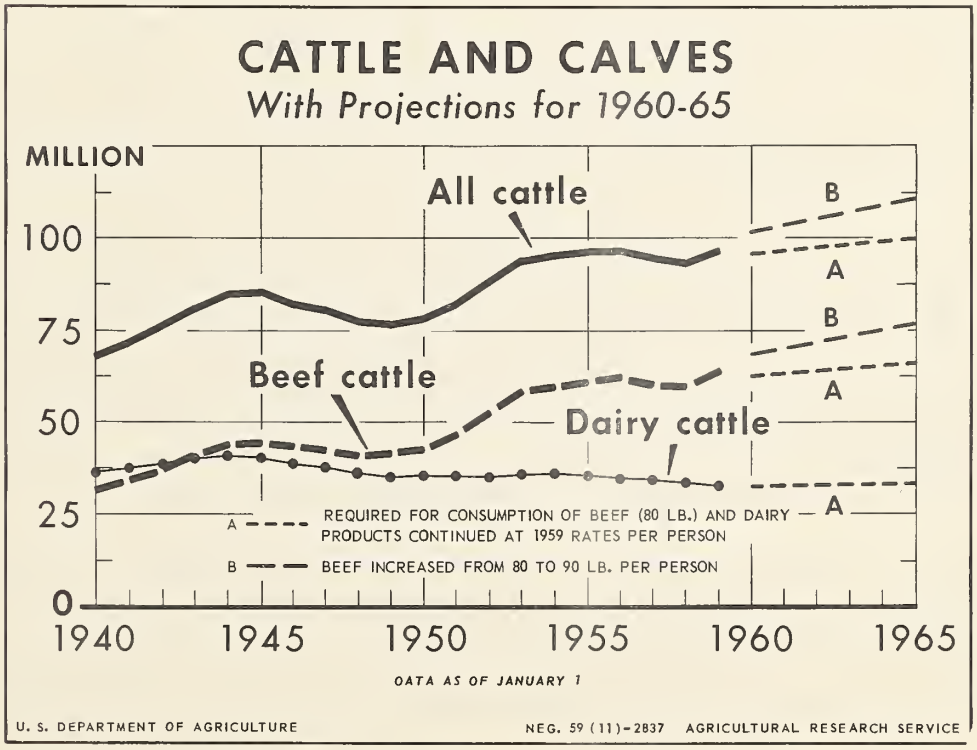

Figure 14

sufficient feed to produce enough dairy products, eggs, and poultry meats to maintain 1959 per capita consumption levels; (2) sufficient feed would be provided to increase total cattle numbers to 110 million through 1965; (3) the residual quantity of concentrates would be fed to hogs. This projection results in a large increase in supplies of pork and an increase of 23.5 pounds per person in the red meats available for consumption by 1965.

Table 17 shows the index numbers of changes in feed available for consumption and the livestock production units that would be fed under both the A and B projections. The A projection would not utilize all available feed, but the B projection assumes that livestock numbers would increase enough to consume the feed that would be produced. It assumes also that the residual supplies of concentrates would be fed to hogs. If part of the surplus acreage of wheat or feed grains were shifted to pasture and utilized for beef cattle or sheep, there would be a relatively smaller increase in supplies of red meat.

Both projections include allowance for exports of feed grains at 10 million tons and wheat at 450 million bushels a year. Lower exports or higher crop yields than those projected would make possible even larger increases in numbers of livestock.

Grain-consuming animal units in 1965 under the B projection would exceed the record level of 1943 when large quantities of accumulated stocks of feed grains were used in addition to current feed production. The number of pigs raised in 1943 was a record high of 122 million. Roughage-consuming animal units in 1965 also would be somewhat higher than the record high of 1943. The rapid increases in production per animal in recent years result in a much larger output for the same number of animal units as in 1943.

Figure 15 shows changes in total livestock output, animal units of breeding livestock, and livestock production per breeding unit since 1940. Total livestock output was more than a third higher in 1959 than in 1940. More production per animal unit has been the main source of the larger livestock output. The total number of breeding livestock is larger now than in 1940, but below the number in the war years 1943-45 when accumulated stocks of feed were used to help expand livestock production. The upward trend in production per animal unit is expected to continue.

Numbers of animal units, of course, would increase much less under the A projection, which assumes continuation of the 1959 per capita consumption level for animal products. But the A projection of livestock production would mean either annual additions of carryover of wheat and feed grains, or that the land devoted to these crops in 1959 would be only partly utilized.

Table 17. - Index numbers of feed consumed or available and of livestock production units, 1953-57 average, 1958, and projections to 1964

(1953-57 = 100)

Year beginning October 1	Feed consumed or available 1/		Livestock production units 2/			
			A projection -		B projection -	
	Grain and other concentrates	All feed including pasture	From all concentrates	From all feed	From all concentrates	From all feed
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
1953-57	100	100	100	100	100	100
1958 3/	117	108	108	106	108	106
1959	129	115	108	105	115	110
1960	125	114	108	106	117	113
1961	127	116	109	107	118	116
1962	128	118	109	107	119	117
1963	130	119	110	109	120	119
1964	132	121	111	110	122	120

1/ Feed consumed by livestock and poultry in 1953-57 and 1958, and feed that would be available for consumption by livestock and poultry from projected production in the 1959-64 crop years.

2/ Livestock production units are based on quantities of feed consumed per unit of livestock and poultry products produced as reported by Earl Hodges in Livestock-Production Units, Annual 1910-57, U. S. Agr. Res. Serv. ARS 43-103, June 1959. The A projection assumes expansion of livestock and poultry production to provide 1959 per capita consumption for expected population. The B and A projections are the same except for expansion of cattle and calves to 110 million on hand on January 1 and of hogs to utilize production of all concentrates projected for 1960-65.

3/ Preliminary estimates.

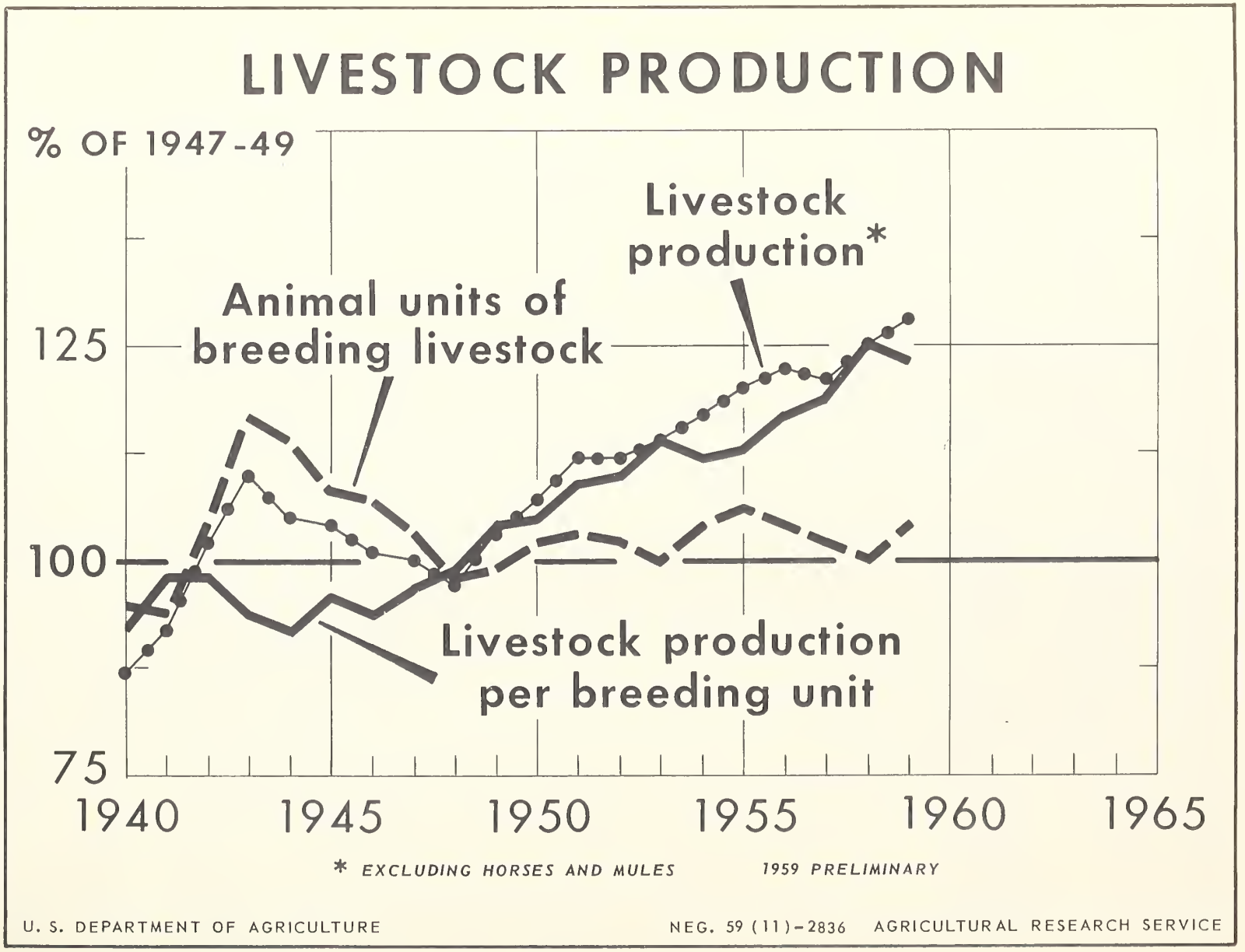
LIVESTOCK PRODUCTION
% OF 1947-49
Livestock production*
Animal units of breeding livestock
125
100
75
Livestock production per breeding unit
1940
1945
1950
1955
1960
1965
* EXCLUDING HORSES AND MULES
1959 PRELIMINARY
U. S. DEPARTMENT OF AGRICULTURE
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Figure 15

Under B projection, the total number of roughage-consuming animal units would increase by the same percentage as the total number of roughage feed units available for consumption by livestock. However, consumption of feed concentrates would average 0.85 tons per grain-consuming animal unit, as compared with 0.81 tons in 1953-57 and 0.90 tons in 1958. As shown in table 17, total feed units available for consumption would increase at about the same rate as total number of livestock production units or total livestock production. Any improvements in livestock output per unit of feed consumed would add to production of livestock products indicated by the B projection.

Fewer Dairy Cattle, More Beef

Numbers of dairy cattle have decreased gradually since 1943 (fig. 14). But milk production per cow has increased more than enough to offset the reduction in number of milk cows. In fact, milk production has increased almost as rapidly as total population. This trend is likely to continue. Both A and B projections assume that milk production per cow will increase at about the same rate as total population. Therefore, if milk-cow numbers are continued at present levels, enough milk would be produced to make possible consumption of dairy products per person at the 1959 level for the population expected in the 1960-65 period.

Beef cattle numbers have shown a spectacular increase in the last 20 years. The total number increased from 30 million in 1939 to 64 million in 1959. This long-term trend is likely to continue. Increases in the number of beef cows during the last 2 years could provide the basis for a large expansion in beef cattle production during the next few years. 5/ Under drought conditions, however, expansion in the Great Plains and Mountain regions would be curtailed.

Eggs and Poultry

Numbers of farm chickens raised would increase only slightly. Numbers of broilers, however, would increase a little more than the rate of population growth in order to maintain 1959 per capita consumption levels

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5/ As previously indicated, the expansion of cattle numbers included in the B projection is in accord with the first projection shown in U. S. Agr. Marketing Serv., Livestock and Meat Situation, May 1959, p. 6. It was termed "Slowing Expansion."

for eggs and poultry meats in the 1960-65 period (fig. 16). The number of turkeys raised would need to increase at about the same rate as total population.

Poultry numbers would change less rapidly than they have in recent years. The number of broilers raised has gone up rapidly while the number of farm chickens raised has decreased. Egg production per layer on hand during the year increased from 134 in 1939 to 201 in 1958, or about 50 percent. Consequently, the number of pullets that need to be raised to provide replacements for laying flocks has decreased. This has been true even though egg production has increased more than has the total human population. About 300 eggs were consumed per person in 1939 as compared with 354 indicated for 1959, but the latter figure reflects some decline below recent high levels.

Projected numbers of farm chickens raised and broilers produced assume that the number of eggs per layer will increase more slowly than it has done in recent years. The total number of farm chickens raised is increased slightly to provide for a small expansion in total number of layers. Expansion in broilers produced, however, would be the main source of additional chicken meat. The projected expansion in number of broilers raised is at a much lower rate than in recent years.

The actual increase in broiler production may be much greater than is shown in these projections. As a source of chicken meat, broilers have become more important than farm chickens. In 1940, broilers accounted for about 15 percent of the total per capita consumption of all chicken meat as compared with 80 percent in 1958.

Hog Production

The number of pigs raised would need to increase from about 99 million in 1959 to 111 million by 1965 to maintain per capita consumption of pork at the 1959 rate for the expected population (fig. 17, Projection A). It would be possible, however, to raise 133 million pigs a year by 1965 if all the grain produced and not required by other livestock and poultry were used to produce hogs (fig. 17, Projection B).

The number of pigs raised has varied widely since 1940. A record high was established in 1943 when 122 million pigs were saved. However, large quantities of feed accumulated from previous years were utilized to raise hogs that year. The number shown in the B projection could be produced from the annual feed production projected in previous sections.

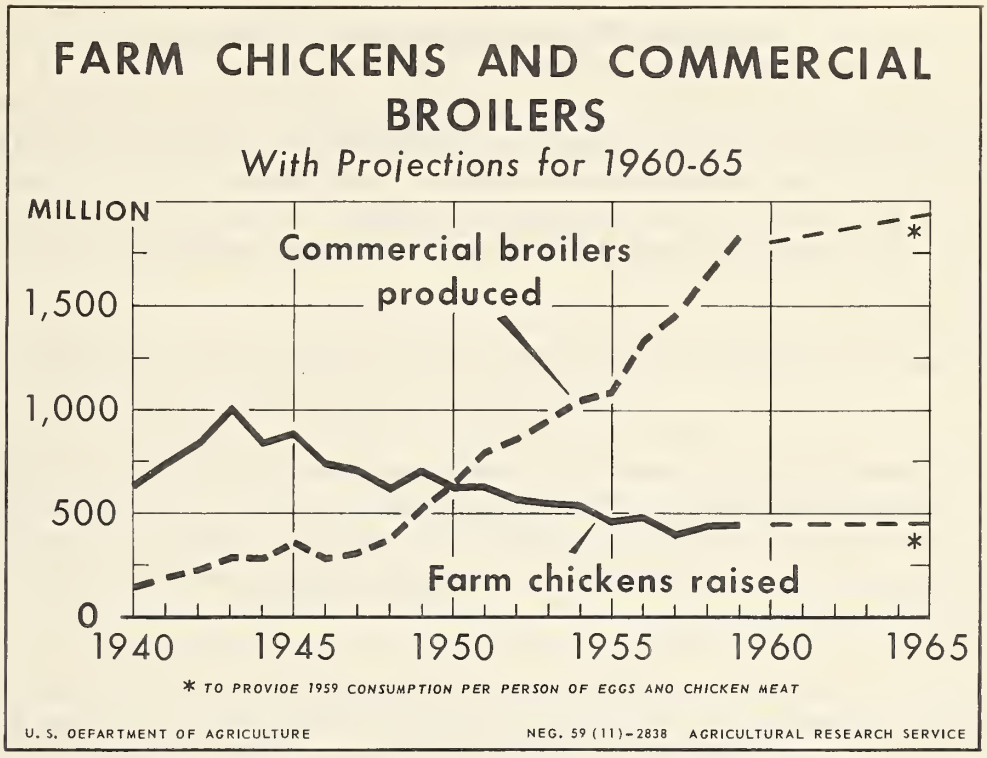

Figure 16

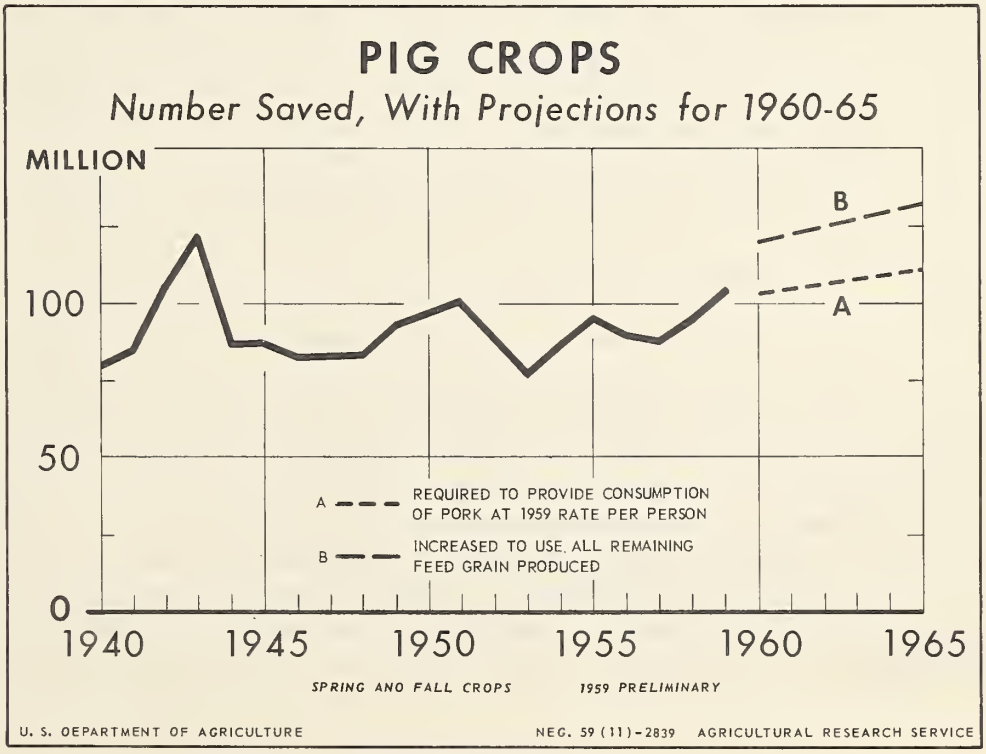

Figure 17

PROSPECTIVE BALANCE, 1960-65

The large stocks of feed grains and wheat now on hand reflect the lack of balance between production and available outlets that has prevailed in recent years. Will the imbalance continue into the 1960's? The production projections for wheat, feed, and livestock made in the foregoing sections provide data for striking trial balances of potential production and use in the years 1960-65.

The balance between production and use can be expressed in two ways:

(1) The acreage available for harvest can be compared with the acreage needed to provide for the food and feed uses that are included in the projections. If the "acreage needed" is much less than the "acreage available," this constitutes a warning that further additions to carryover should be expected, unless steps are taken to increase outlets or to divert acreage from wheat and feed crops.

(2) A computation can be made of the livestock products that would be available for consumption if all the acreage available were utilized, and the excess capacity used to feed additional livestock.

In figure 18, the difference between the acreage of wheat and feed grains harvested and the acreage that was required for various purposes represents the acreage equivalent of additions or subtractions to carryover stocks of these crops for the years 1950-59. Total production of wheat and feed grains in 1950 was approximately equal to the quantities disposed of before 1951 crops were harvested. In 1951, they were less than the quantities disposed of, and stocks of wheat and feed grains were reduced. But there were large additions to stocks from the 1952, 1953, and 1954 crops. The excess production in these years was equivalent to the annual output from about 20 million acres.

Acreage-allotment programs reduced acreages of wheat and feed grains beginning in 1954 and Soil Bank Programs initiated in 1956 resulted in further reductions. The total acreages of wheat and feed grains combined decreased from 201 million acres in 1954 to nearly 180 million in 1956. Partly because of drought, production in 1956 was about equal to the quantities of these crops disposed of before the next year's harvest. But excess acreage reappeared in 1957; and in 1958 and 1959, the excess acreage is again about 20 million acres, or more than 10 percent of the total harvested acreage. A part of the present imbalance can be attributed to the exceptionally high yields in 1958 and 1959.

The projections for 1960-65 of acreage available for harvest and acreage needed, as shown in figure 18, indicate that the imbalance may continue for several years. The differences between acreage available for harvest and acreage needed (fig. 18) suggest a potential excess of from 15 to 18 million acres.

To recapitulate the conditions underlying these projections:

(1) Continuation of 1959 harvested acreages of wheat and feed grains except for a reduction of 3 million acres to allow for expansion of the Conservation Reserve Program.

(2) Yields per acre increasing gradually as indicated in table 5. If the yield of corn should follow the long-term trendline shown in figure 8, however, there would be an additional excess of 4 or 5 million harvested acres of feed grains, unless offsetting reductions in the yields of other crops occurred. But the excess would be reduced, or even eliminated; if severe drought or other unfavorable growing conditions were experienced. The excess acreage also would be less if per capita consumption of livestock products is increased above 1959 levels.

(3) Exports are projected at 450 million bushels of wheat and 10 million tons of feed grains. Larger exports of feed grains would reduce the imbalance proportionately. But reductions to 250 million bushels of wheat exports would add nearly 10 million acres.

(4) No change in the efficiency of animals in converting feed into livestock and poultry products.

(5) Domestic use of feed grains to provide per capita consumption of livestock and poultry products at 1959 levels for the population expected in 1960-65.

In considering the second method of striking a balance between production and use, we need first to examine whether the 1959 levels of per capita consumption of livestock products constitute reasonable expectancy for the years 1960-65. Examination of table 16 indicates that the estimated consumption of poultry meat and eggs is at relatively high levels in 1959. Consumption of fluid milk per person is likely to increase, but this may occur at the expense of milk now going into manufacturing uses. Increases in per capita consumption of poultry meat, eggs and milk, therefore, may not require much additional feed.

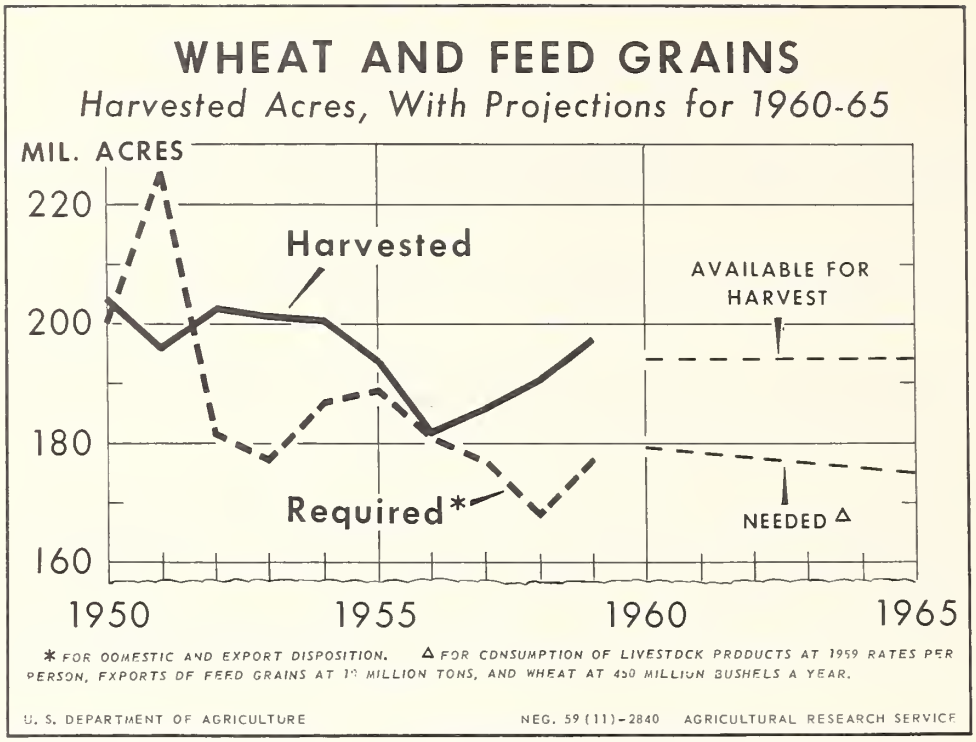

Figure 18

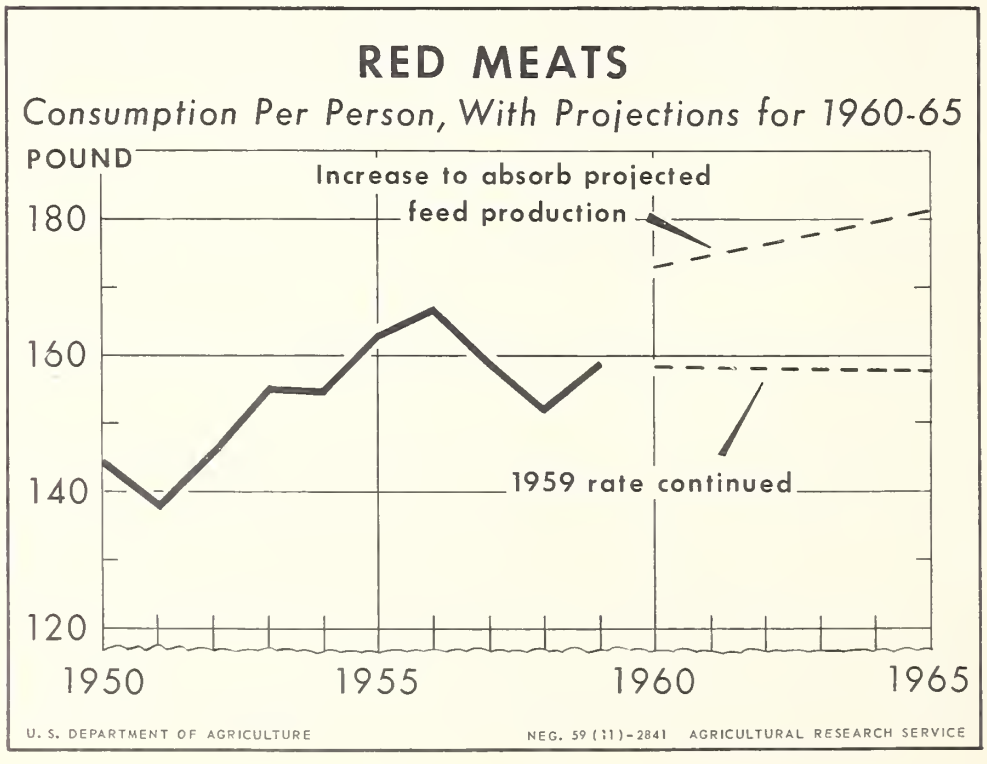

Figure 19

Consumption of red meat is likely to increase above the 1959 estimate of 158 pounds per capita. The average consumption for the years 1954-58 was 159.1 pounds, and in 1956, consumption reached a record level of 166.7 pounds. But in that year, 5.5 pounds less poultry meat per capita was consumed; also in 1955-56, farm prices of cattle and hogs were at low levels. Some analyses indicate that under present conditions prices to producers are vulnerable when the supply of red meat for consumption is much in excess of 160 pounds per capita. 6/

Nevertheless, some increase in per capita consumption of meat might occur during 1960-65 without depressing prices if real incomes of consumers increase during these years. For example, Daly presents data indicating that under such conditions per capita consumption of red and poultry meats together might increase by about 7 pounds above 1959 levels by 1965. 7/ Continuation of the 1946-58 upward trend in per capita consumption of red meat would mean 7 pounds more per person by 1965.

In view of the high per capita consumption of poultry meat in 1959, it seems likely that large increases in consumption of red meat cannot take place without depressing the price structure for meat animals. But figure 19 indicates that per capita consumption of red meats would need to increase from 158 pounds in 1959 to 173 pounds in 1960, and 181 pounds in 1965, in order to absorb all the feed grains and wheat that would be available for feed after accounting for other uses of wheat and feed grains. This would represent an increase of 15 pounds per person in 1960, and 23 pounds in 1965. The supply of red meat would be somewhat smaller if a part of the excess wheat and feed grain acreage were shifted to pasture, but such a shift may require program changes. An increase in red meat supplies of 10 to 15 percent per person would mean price trouble for livestock producers.

6/ See Cavin, J. P., The Present Feed-Livestock Situation, Proc., Iowa State College Feed and Livestock Workshop, February 16-18, 1959, pp. 4-5.

7/ See Daly, Rex F., Prospective Demands for Food and Fiber, Policy for Commercial Agriculture, Its Relation to Economic Growth and Stability, Joint Economic Committee, 85th Congress, 1st Session, November 22, 1957, pp. 108-118.